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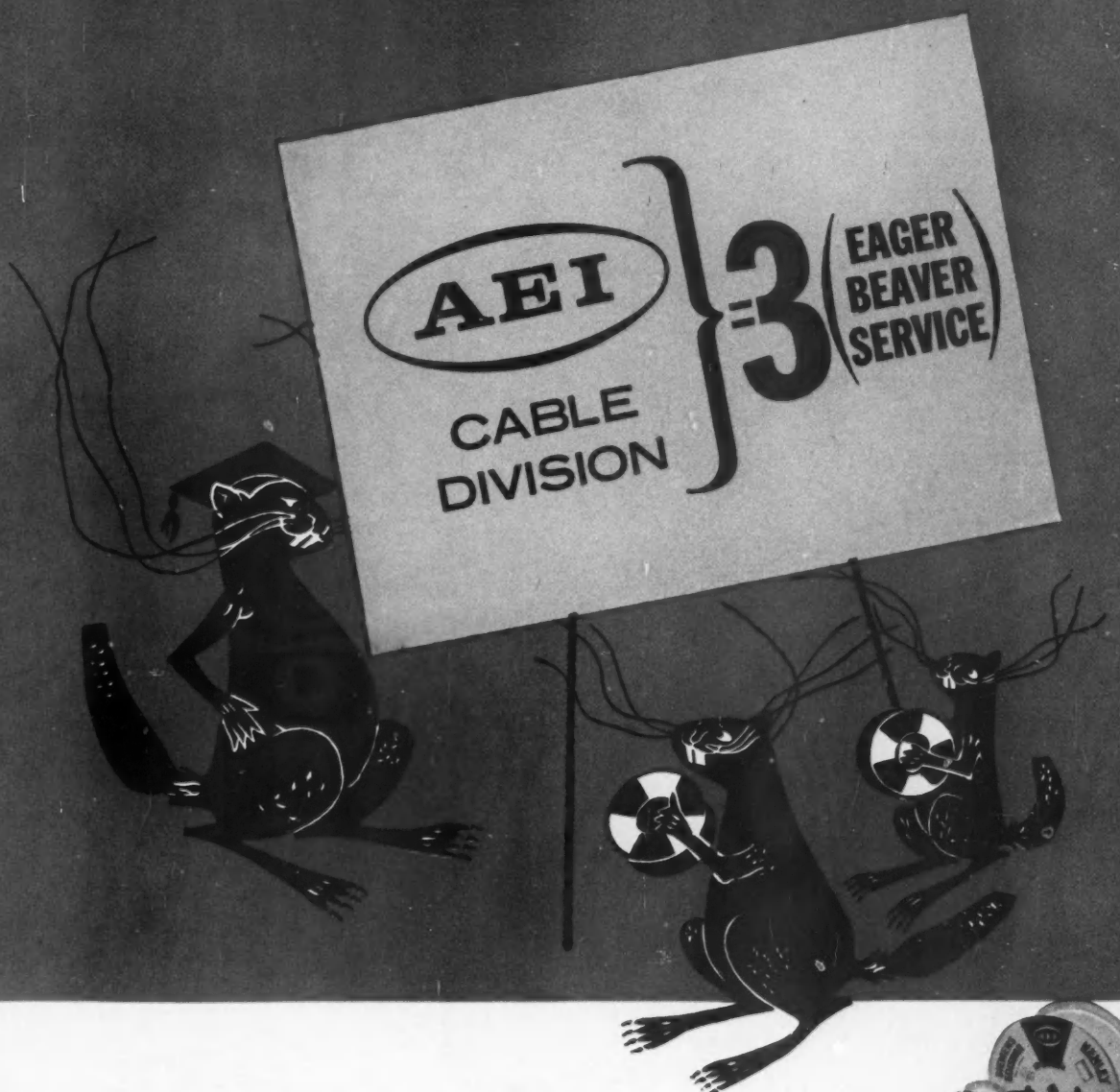

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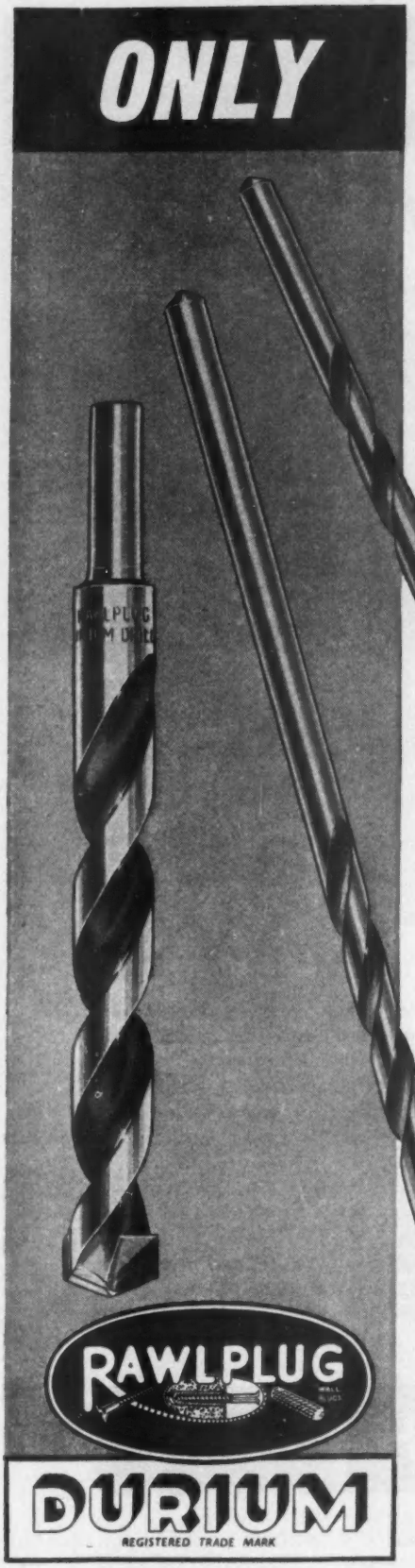

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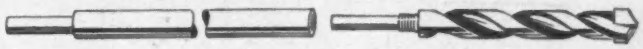
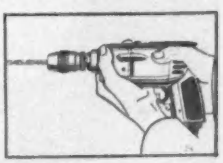


Durium Drills are made for all sizes of Rawlplugs from No. 6 to No. 30 (i.e. drill cutting diameters $\frac{1}{4}$" up to 1"), and for Rawlbolts sizes C, D, E & G. Durium Drills are also made in the Long Series to facilitate the work of laying conduits, cables, pipes, etc.—five cutting diameters ($\frac{1}{2}$" up to $\frac{3}{4}$") in 6" drilling lengths, and six cutting diameters ($\frac{1}{2}$" up to 1") with threaded ends to take extension rods which provide for overall drilling lengths of approximately 12" and 16".



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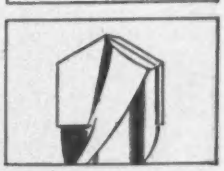

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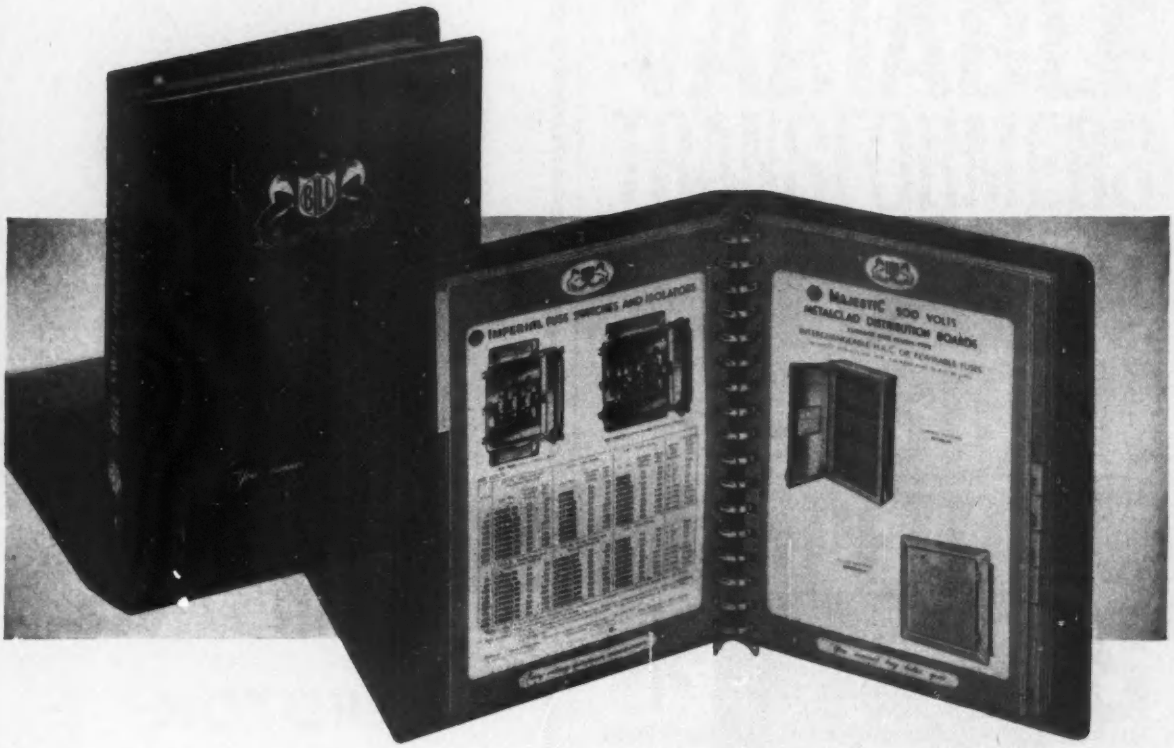

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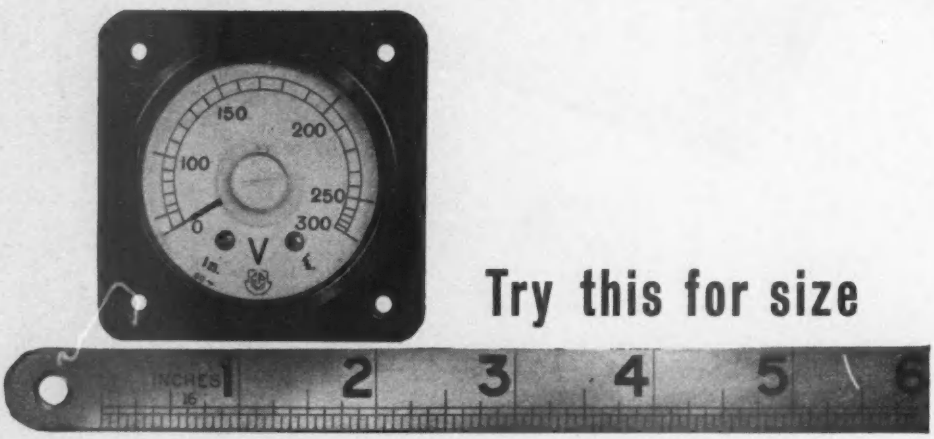

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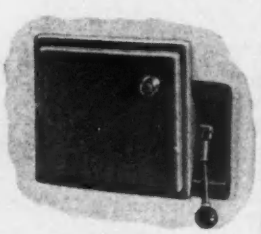

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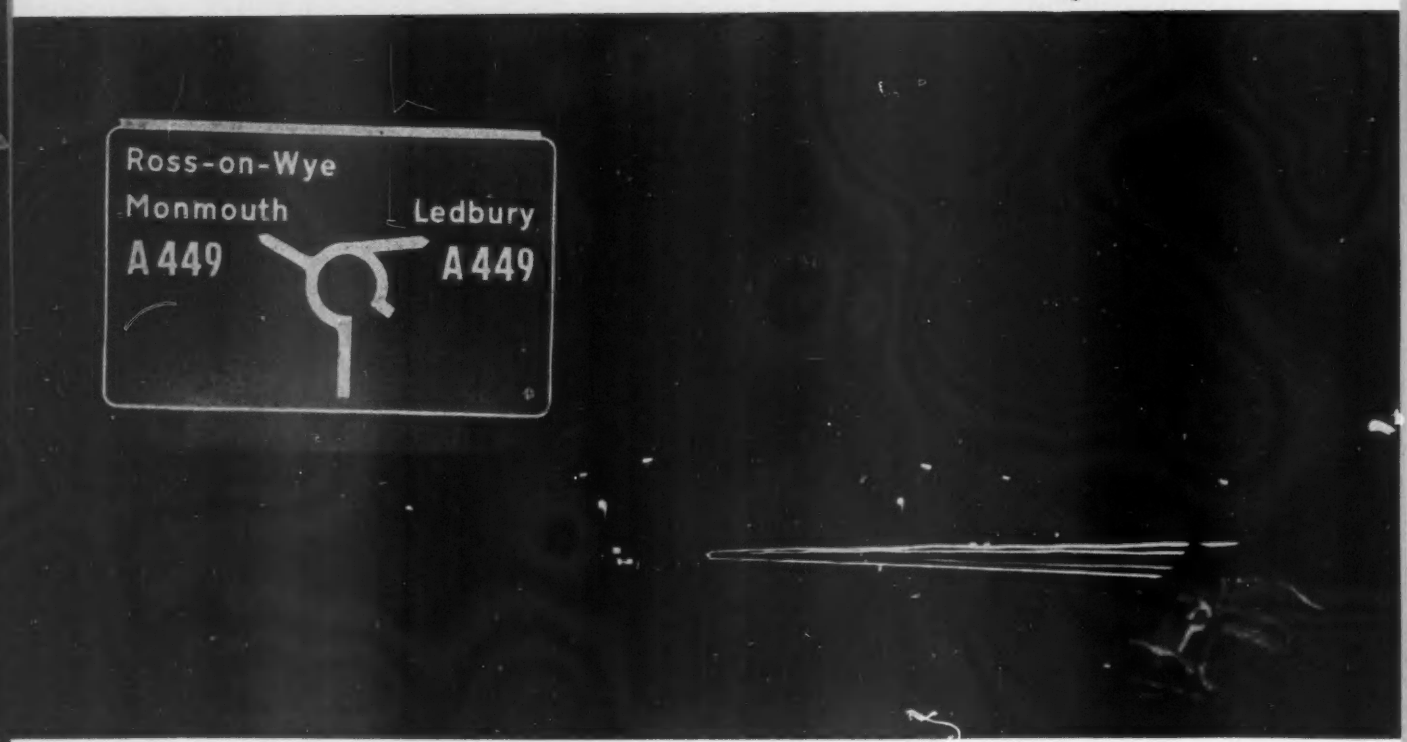

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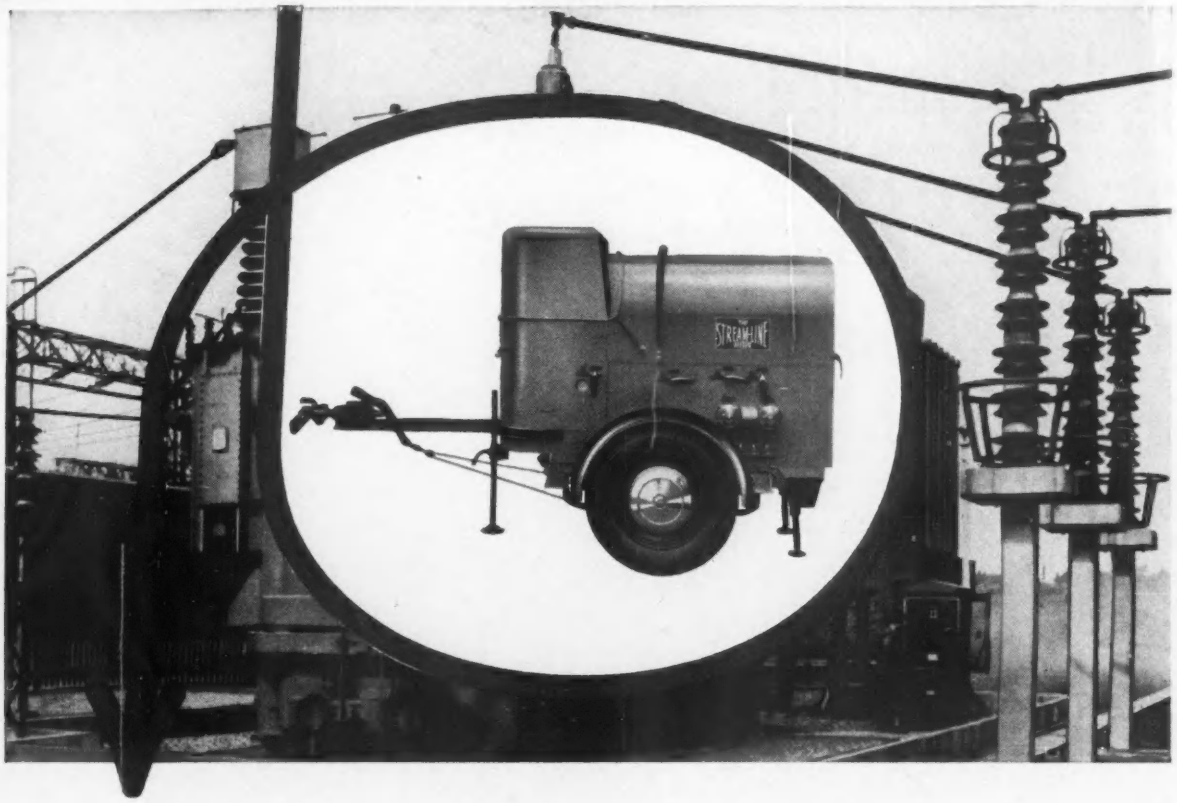
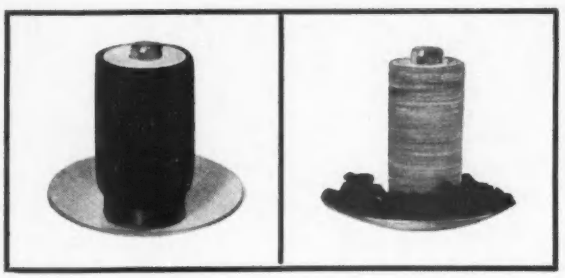


Loop in a Stream-Line filter



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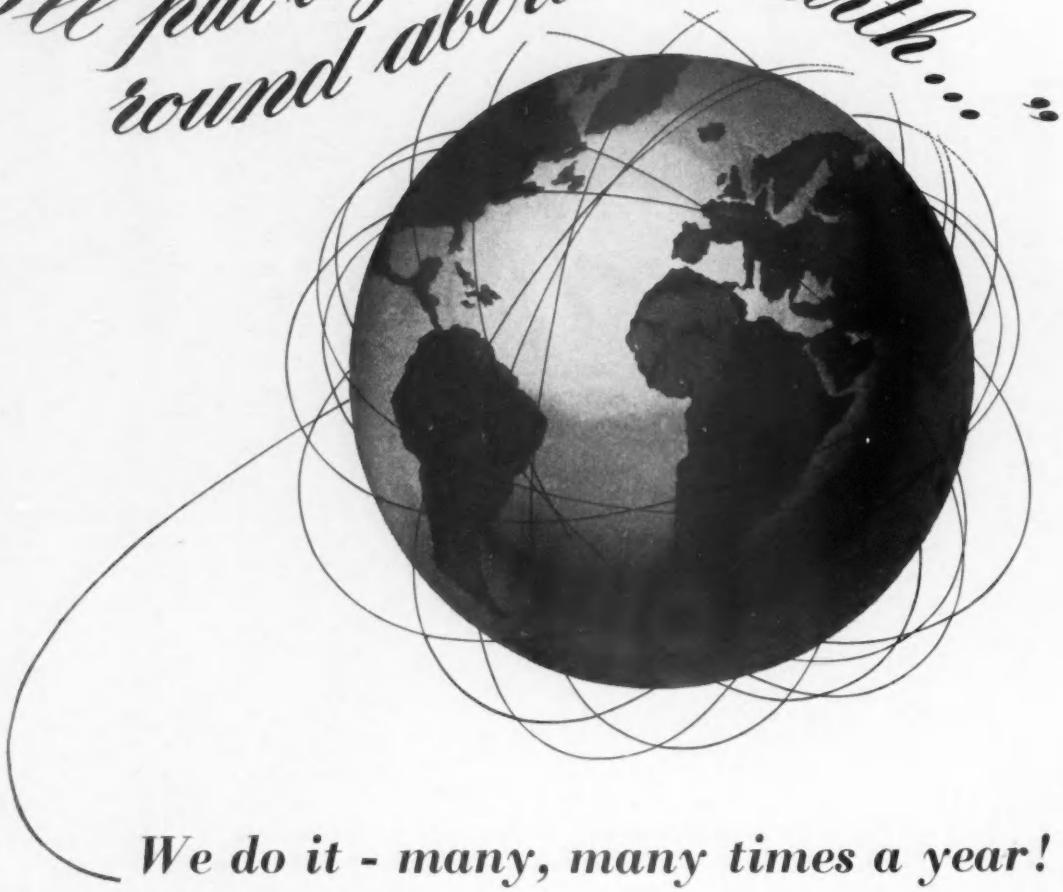

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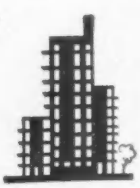

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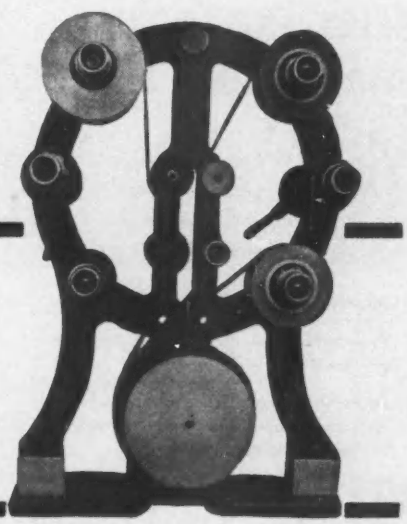

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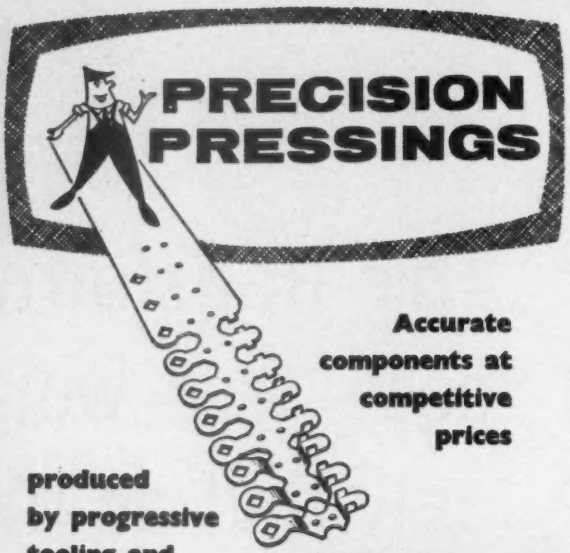

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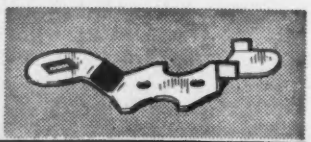

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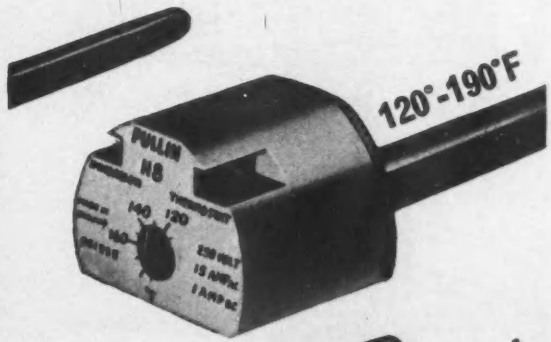
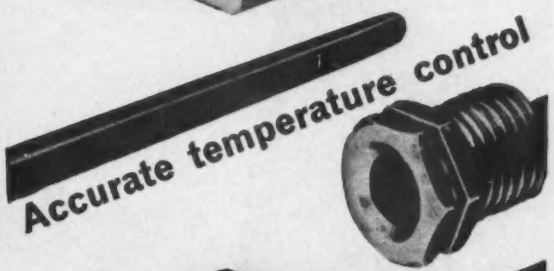
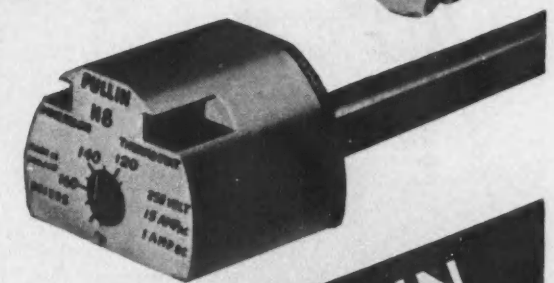
H8 Immersion Thermostat







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■ These advertisements are appearing in the farming and country magazines. The Central Electricity Generating Board thank electrical contractors for their co-operation in the past, and know that they will do all they can to preserve the amenities of the countryside.

CEGB

who make and supply electricity to 12 Area Electricity Boards in England and Wales (which re-sell to consumers) and British Railways.

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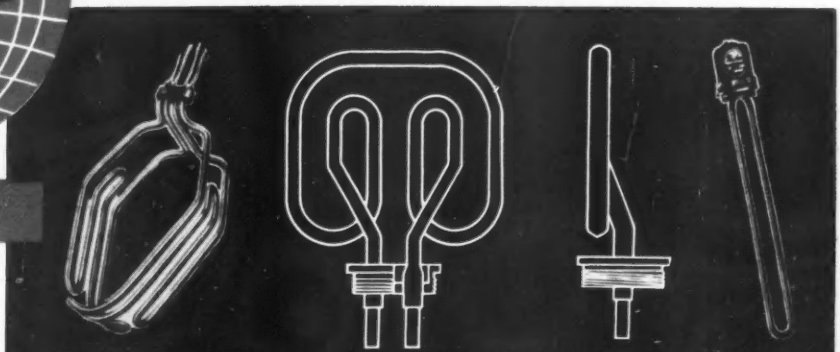
Backer

Tubular Sheathed Elements for heating . . .

Liquids



Washing Machines - Immersion Heaters - Sterilizers, Urns - Kettles

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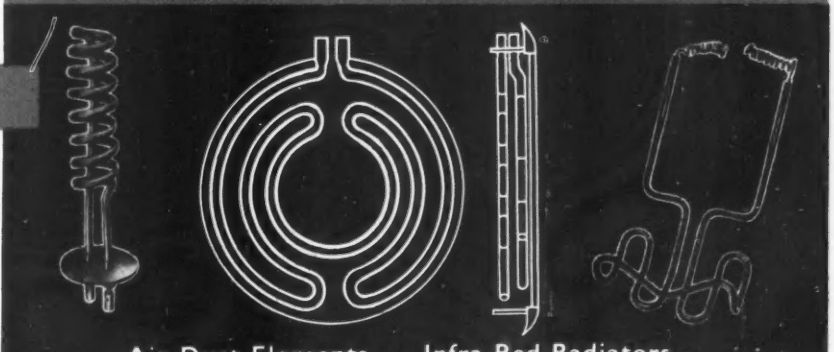

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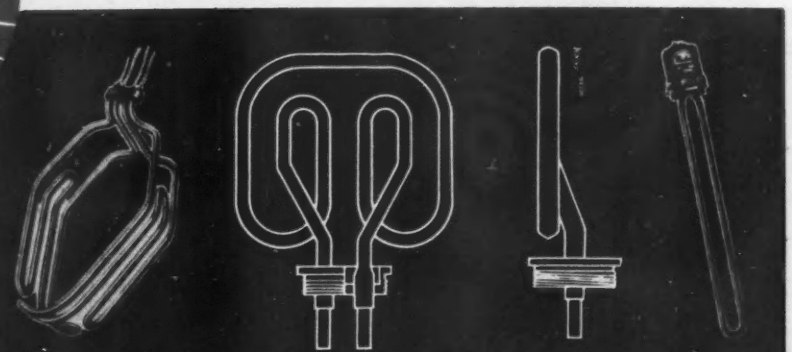

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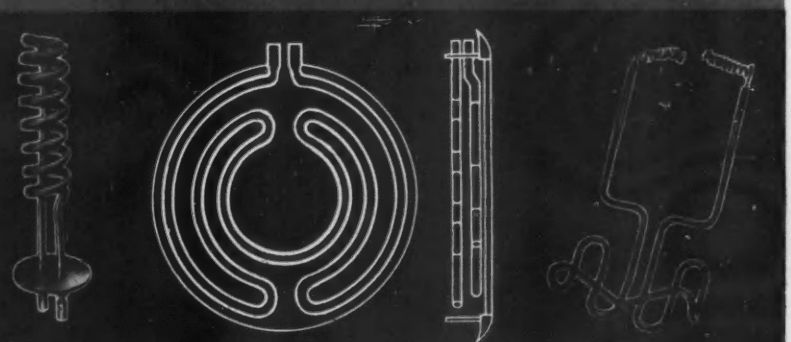

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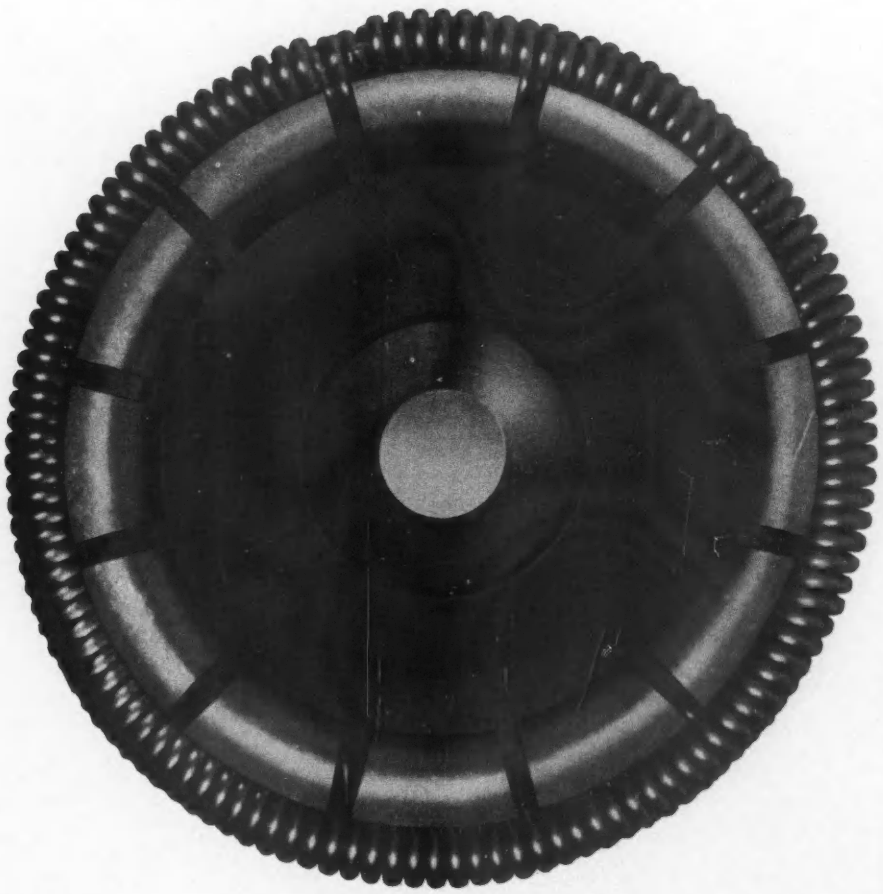

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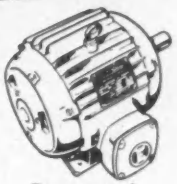
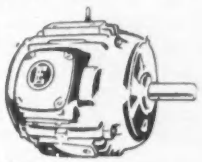
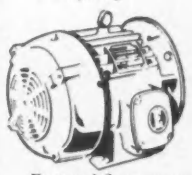


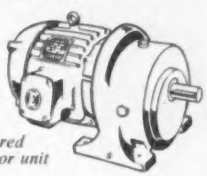
Foot mounted



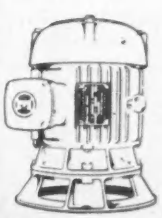
Pad fixing



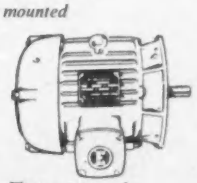
Foot and flange mounted



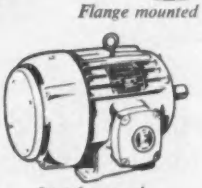
Geared motor unit



Skirt mounted



Flange mounted



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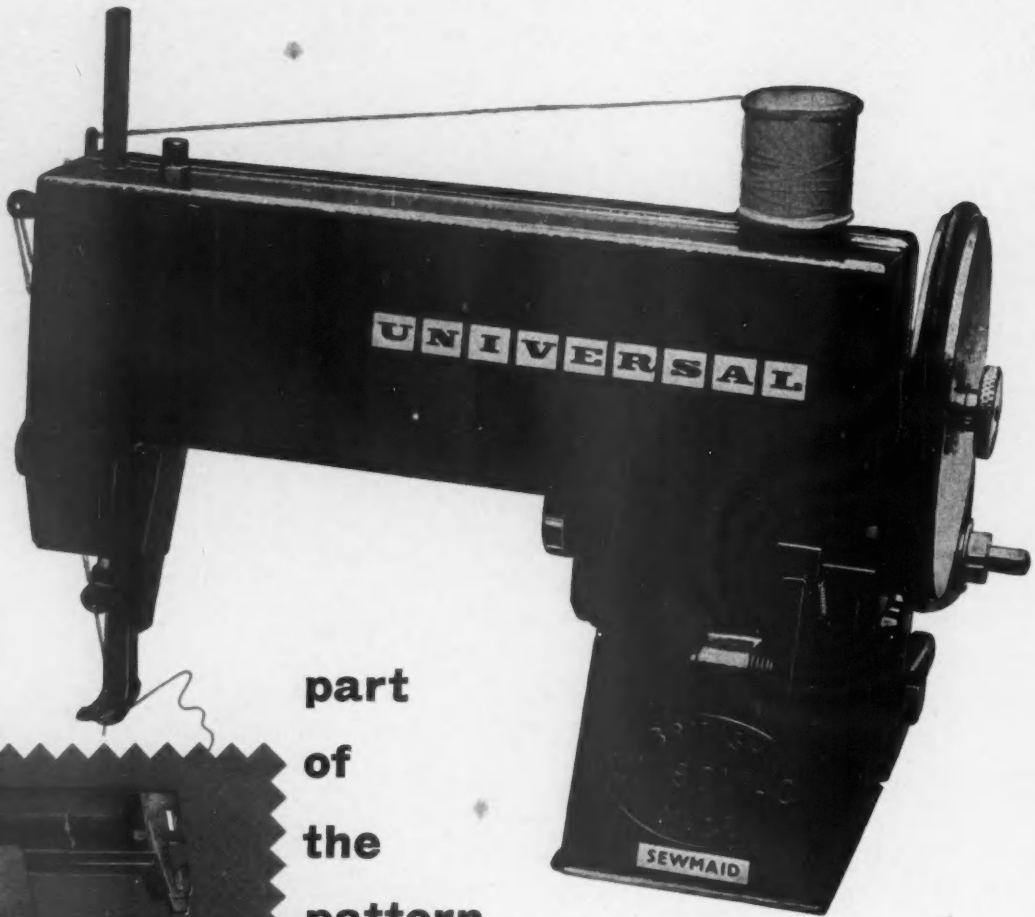
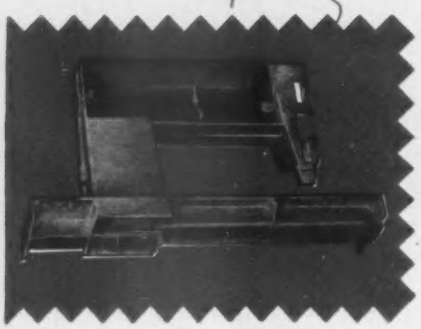
INDUSTRIAL MACHINES DEPARTMENT, PHOENIX WORKS, BRADFORD
The English Electric Company Limited, English Electric House, Strand, London, W.C.2.

DM. 90



part of the pattern



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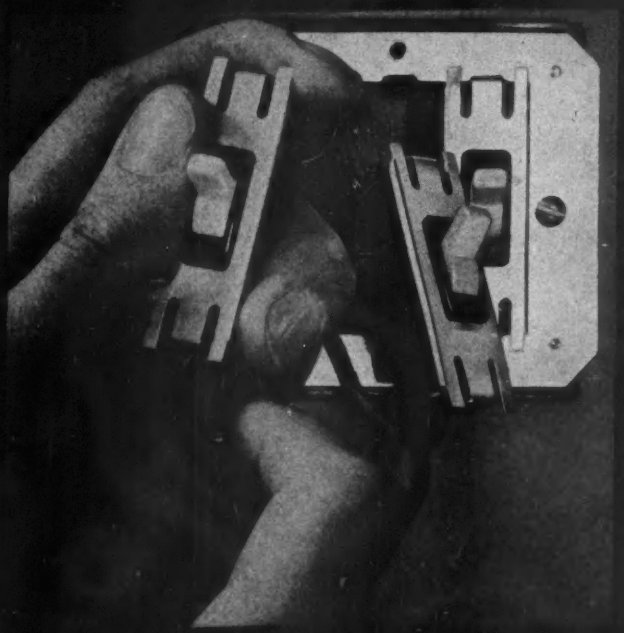

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15 amp 1 way S.P.
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5 amp 2 way S.P.
5 amp 2 way & off
5 amp intermediate
5 amp 1 way secret
5 amp 2 way secret
Bell Push
Neon Indicator
Blanking Unit

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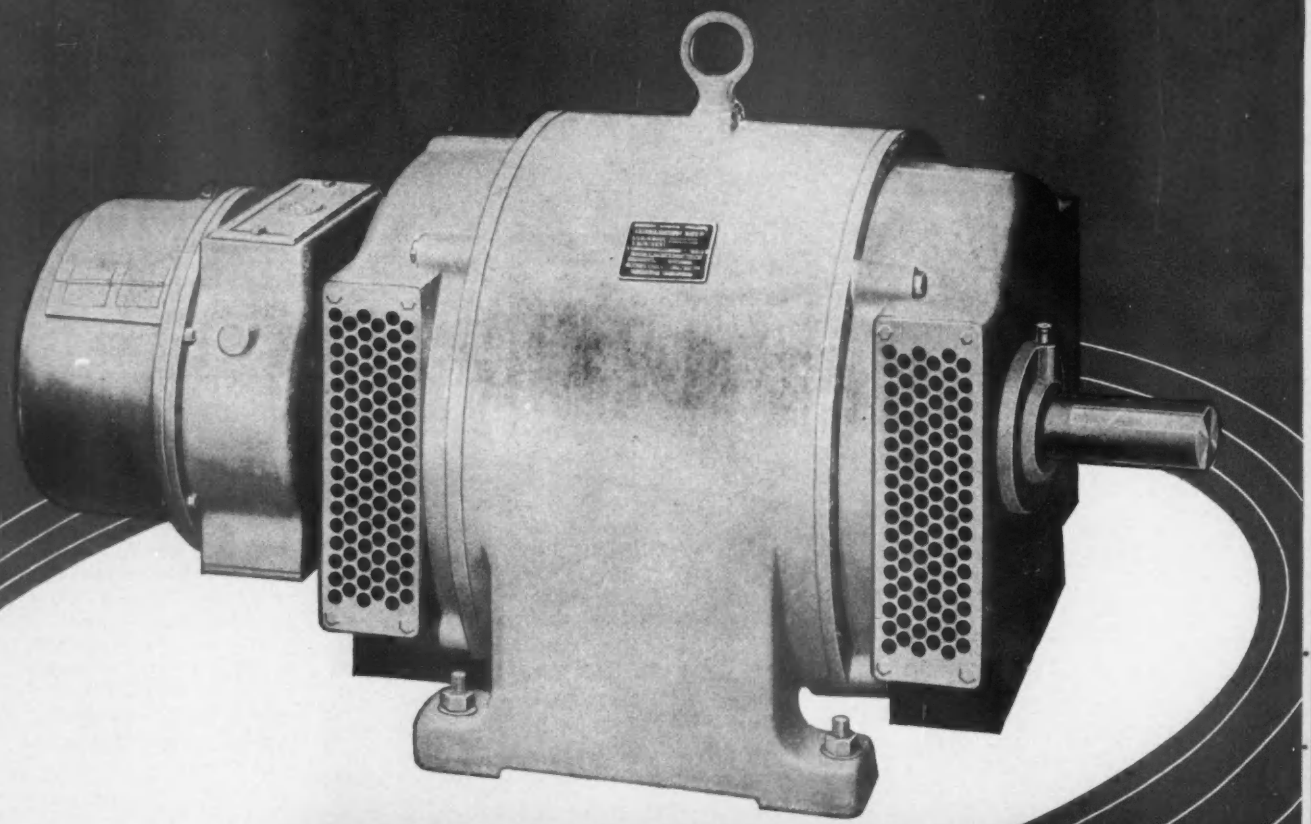
for exceptionally heavy duties



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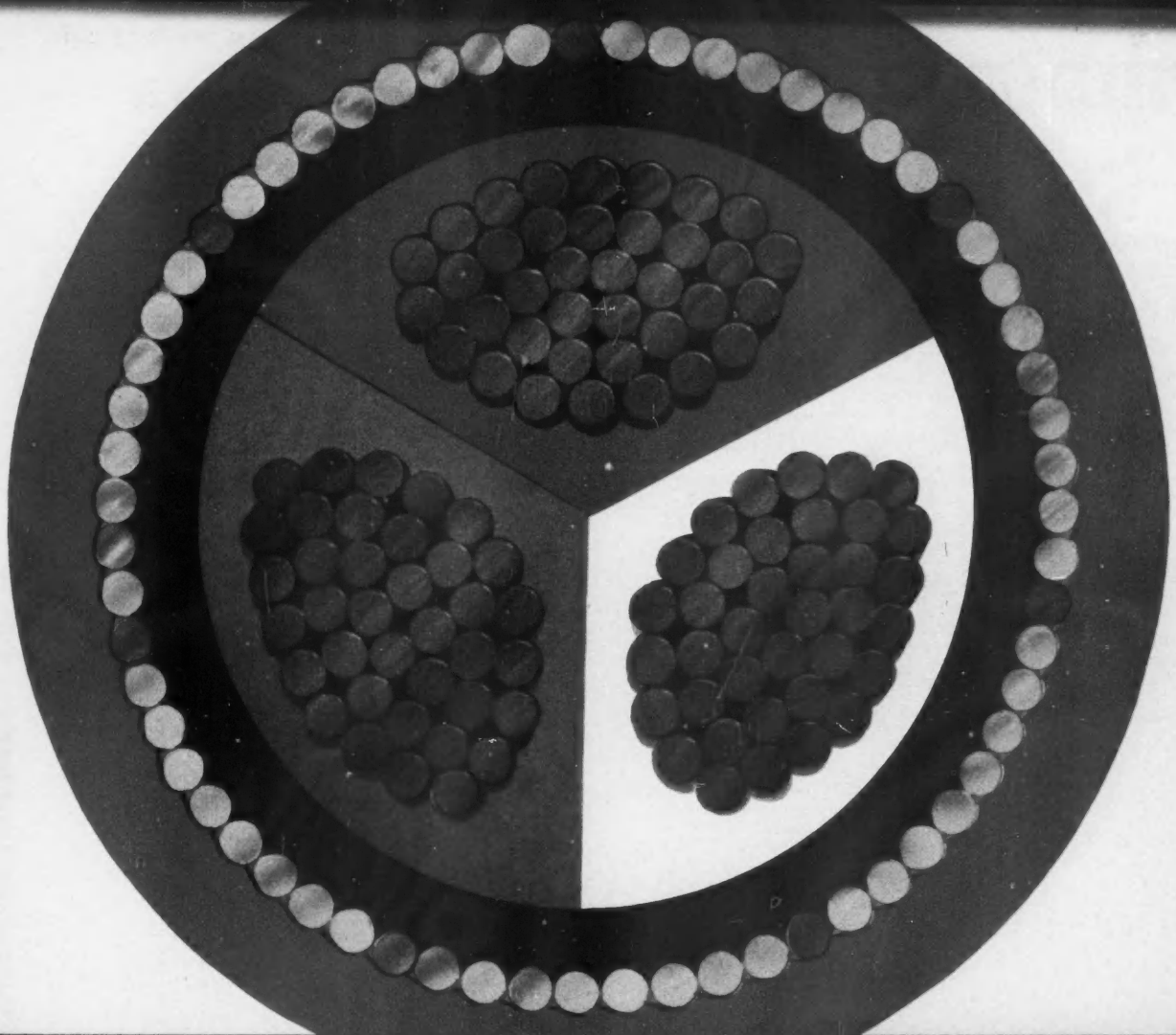
covers capacities 50 550 B.H.P.



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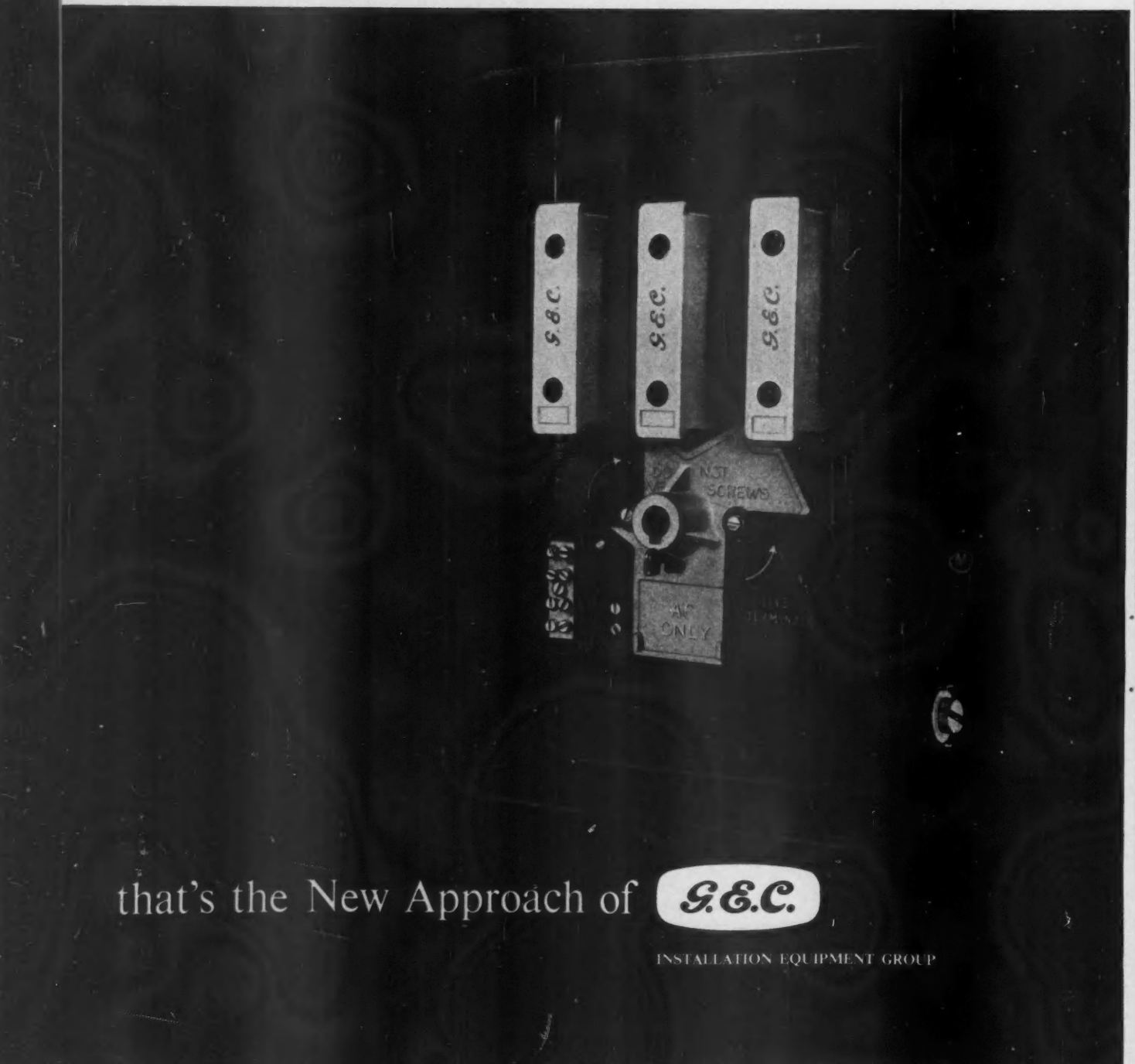

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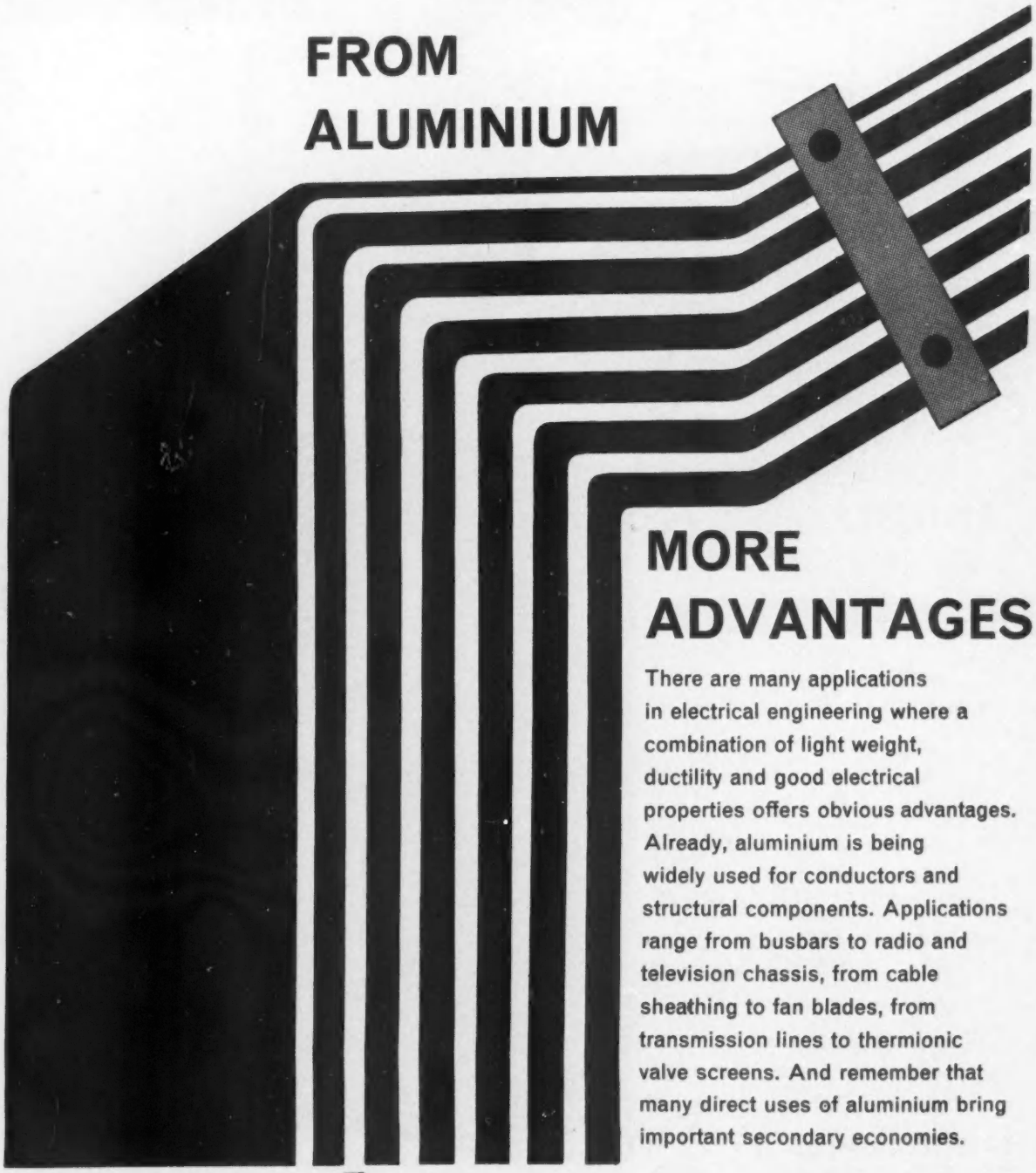

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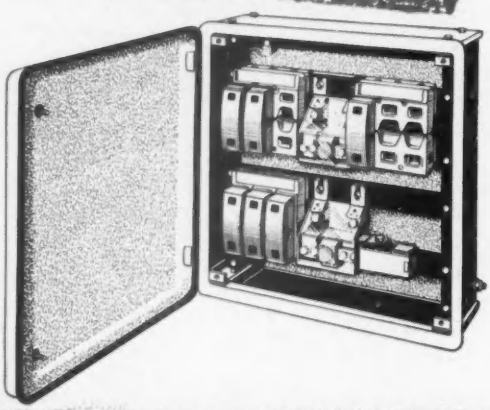
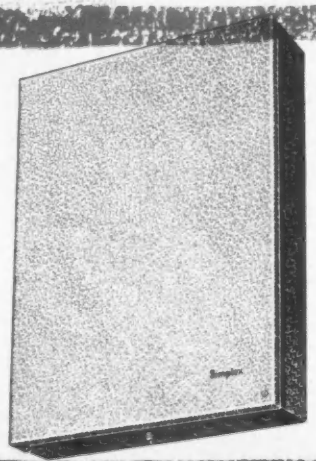
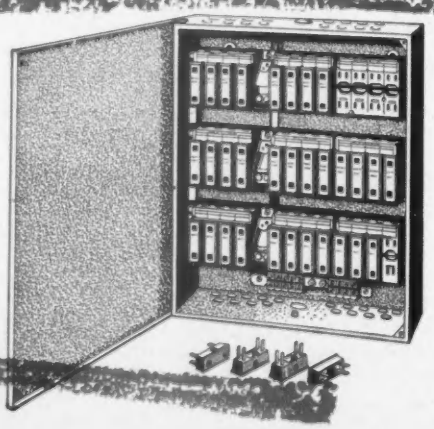


Star Distribution Fuseboard with cover open; some fuses are removed to show dead-front feature.



Star Economy Distribution Fuseboard.



Star Economy Distribution Fuseboard with cover open showing shields, and dead-front feature when fuses are removed.

S.3

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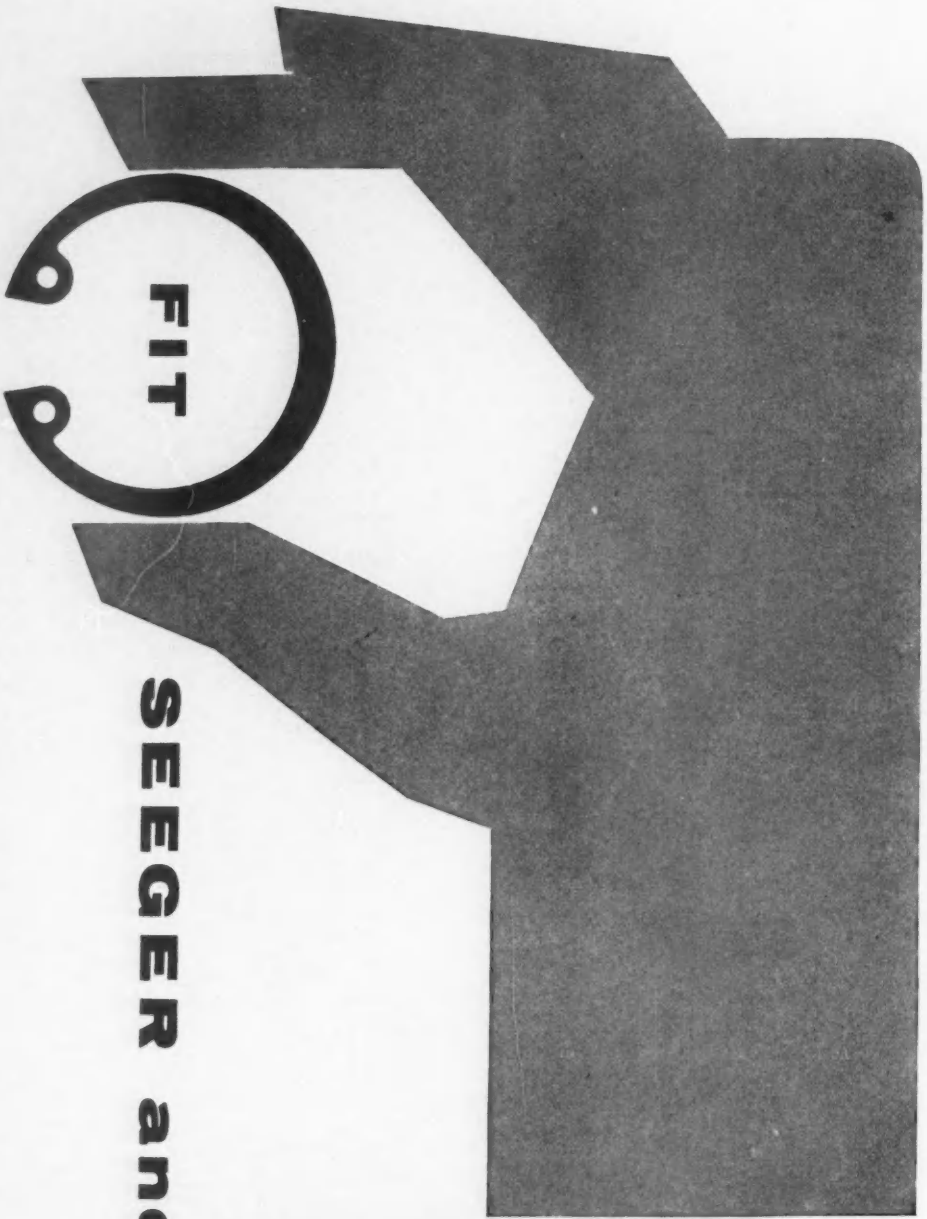

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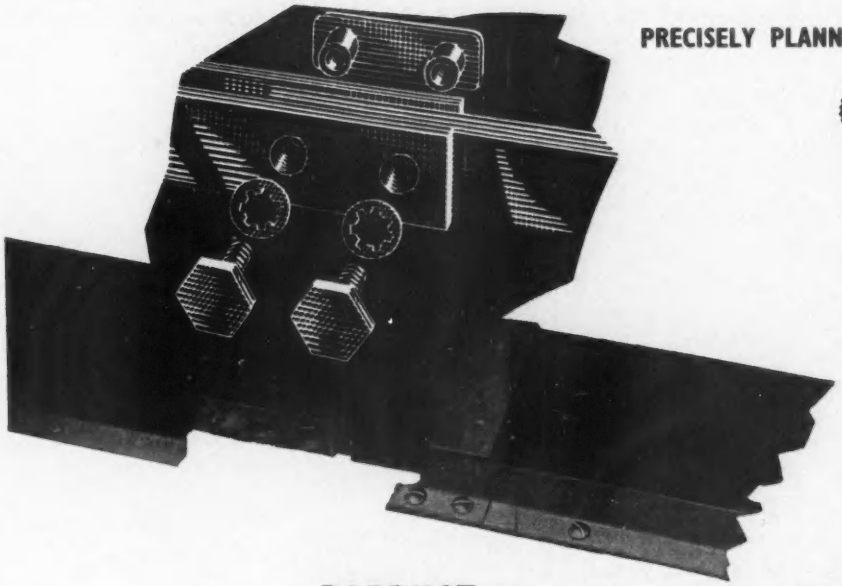

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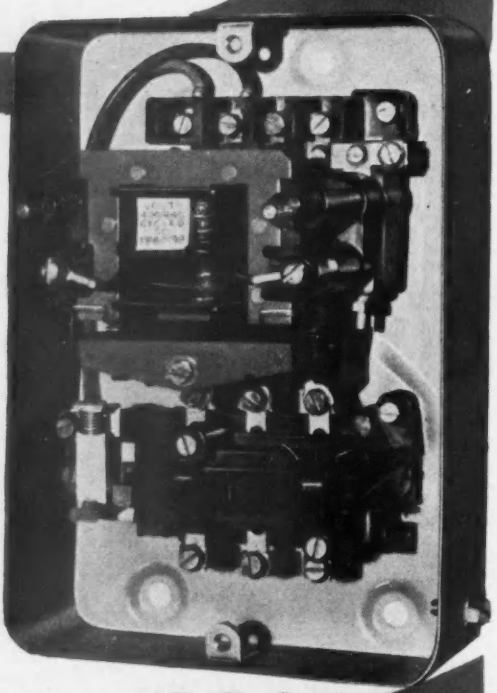

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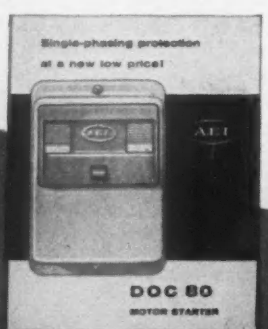

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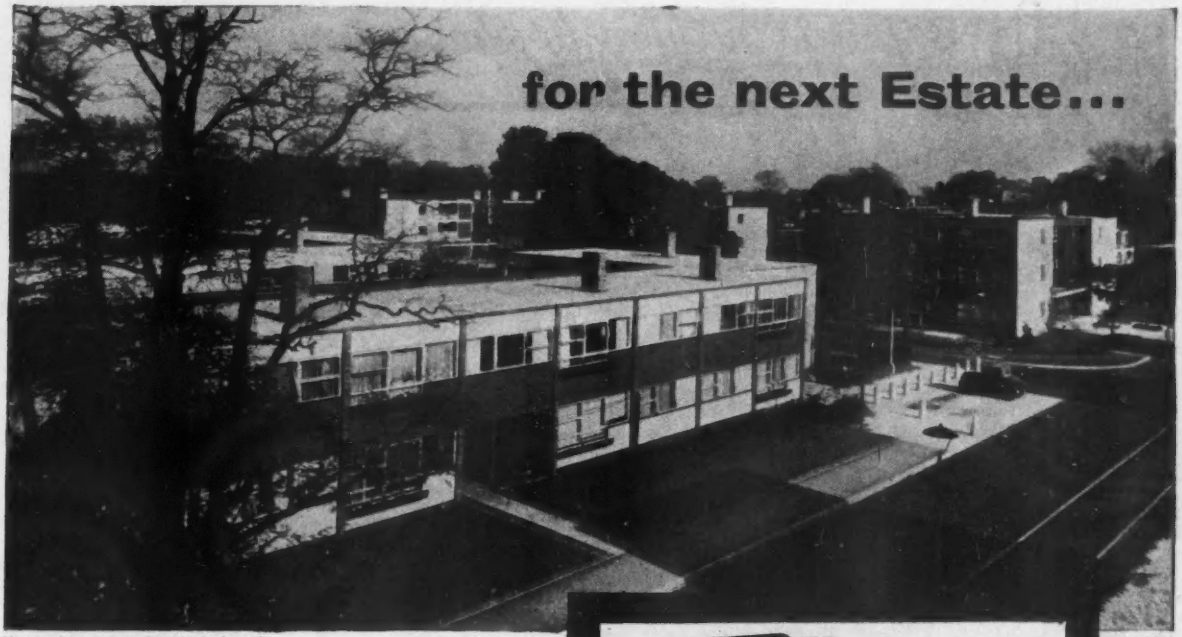

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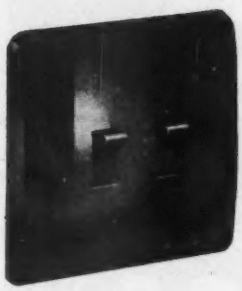
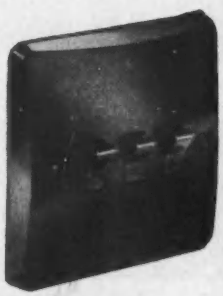
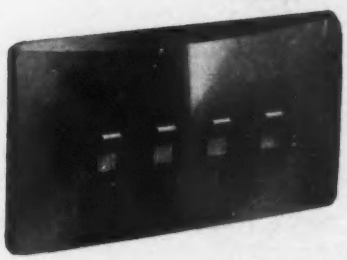


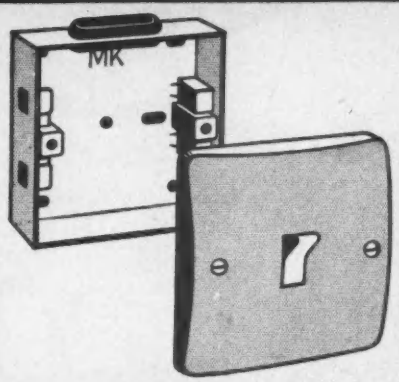
List No. 4822
Two gang with 2⅝" fixing centres.



List No. 4833
Three gang with 2⅝" fixing centres.



List No. 4824
Four gang with 4¼" fixing centres.



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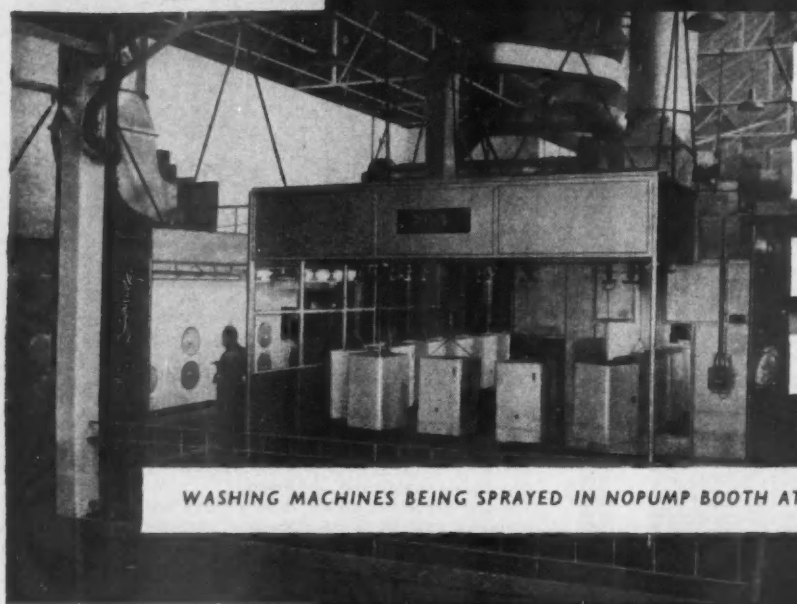

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ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Circuit Protection by M.C.B's 37
by H. W. Baxter, B.SC., M.I.E.E.

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Dans ce numéro

Disjoncteurs miniature 37
Des mesures ont été prises de l'énergie I^2R qui se produirait dans les câbles protégés par des disjoncteurs miniature, pendant la durée de temps s'écoulant entre un court-circuit et l'ouverture des contacts du disjoncteur. Dans certains cas, le conducteur du câble peut fondre, quoique 6½ mètres de câble entre disjoncteur et emplacement du court-circuit suffisent pour introduire assez d'impédance qui empêcherait cette fusion.

Triage des wagons ferroviares au moyen d'une calculatrice 42
Dans la gare de triage de Margam (British Railways), les wagons de marchandises sont automatiquement triés par des aiguillages sous contrôle d'un programme à ruban perforé. Pour contrôler la vitesse, l'on se sert de "retardateurs", qui ralentissent les wagons en s'appuyant sur les flasques des roues. Ces dispositifs sont opérés sous commande d'une calculatrice analogique électronique, dans laquelle on introduit des renseignements à partir du programme établi d'avance, ainsi que la vitesse des wagons mesurée par un dispositif radar dont l'antenne est fixeé entre les rails. Le système comporte des aiguillages à fonctionnement électro-penumatique, et un très vaste circuitage de voies.

Développement de l'énergie nucléaire 45
Les progrès effectués en 1960-61 par la UK Atomic Energy Authority quant à la recherche et la mise au point comportent entre autres des travaux portant sur des réacteurs nucléaires refroidis au gaz pour températures supérieures, sur un réacteur modéré à l'eau lourde et sur des réacteurs à fision rapide.

La techinque électrique en Russie 49
Au cours d'une exposition tenue ce mois-ci à Londres figurera du matériel pour la technique électrique fabriqué en Russie. Citons-en une centrale hydroélectrique de 4.500 MW, représentée par une grande maquette, ainsi que la maquette d'une fonderie électrique d'acier.

In dieser Nummer

Kleinausschalter 37
Es wurden Messungen der I^2R-Energie vorgenommen, mit deren Erzeugung in von Kleinausschaltern geschützten Kabeln in der Zeit vom Auftreten eines Kurzschlussfehlers bis zur Oeffnung der Ausschaltkontakte gerechnet werden muss. Unter gewissen Voraussetzungen besteht wohl die Gefahr, dass der Kabelleiter durchschmiltz, obwhol schon der Widerstand einer Kabellänge von nur 6½ Metern zwischen Ausschalter und Fehlerstelle dazu ausreicht, dies zu verhüten.

Rangierbetrieb mit Rechner 42
Im Rangierbahnhof von Margam der British Railways werden Güterwagen automatisch aussortiert, wobei die Weichen der Steuerung durch ein Lochstreifenprogramm unterliegen. Zur Geschwindigkeitsregelung werden Verzögerer verwendet, die die Wagen durch Druck gegen die Radflanschen verlangsaman. Die Arbeit dieser Verzögerer wird von einem elektronischen Analogrechner geregelt, in den sowohl Information aus einem vorher zusammengestellten Programm als auch die Geschwindigkeit der Wagen eingespeist wird, welch letztere von einem Radargerät ermittelt wird, dessen Antenne zwischen den Schienen angebracht ist. Die Anlage umfasst elektro-pneumatisch betätigte Weichen und eine ausgedehnte Geleiseverdrahtung.

Fortschritte im Kernkraftwesen 45
Die von der UK Atomic Energy Authority bei ihren Forschungs- und Entwicklungsarbeiten im Jahre 1960-61 erzielten Fortschritte betreffen gasgekühlte Kernreaktoren für erhöhte Temperaturen, einen mit schwerem Wasser moderierten Reaktor und Schnellspaltreaktoren.

Elektrotechnik in Russland 49
Russische elektrotechnische Anlagen werden diesen Monat auf einer Londoner Ausstellung zur Schau gestellt. Sie umfassen u.a. ein 4500 MW Wasserkraftwerk, das durch ein Grossmodell veranschaulicht wird, und das Modell einer elektrischen Stahlgiesserei.

FEATURES

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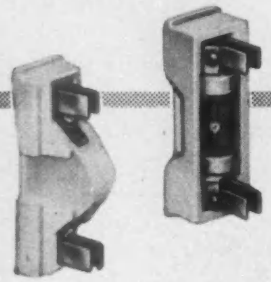
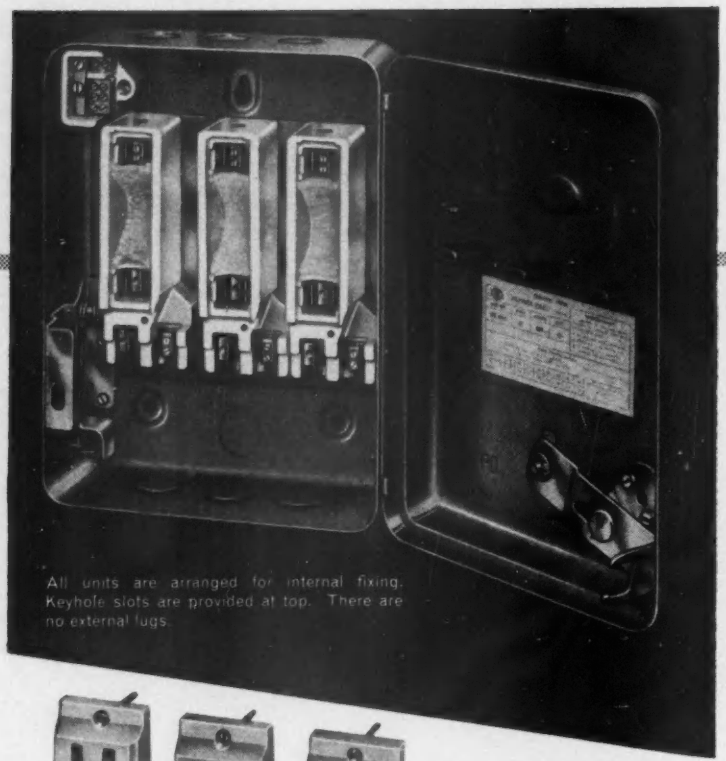
The cases are of one piece pressed steel with hinged covers, rustproofed and finished grey stove enamel.

Three semi-pierced knockouts are provided at top and bottom and one knockout at left hand side of case for coupling switchgear to adjacent motor starters, etc.

Fuses are of the "Kantark-Exel" pattern the bases of which will accept semi-enclosed rewirable or H.R.C. fuse carriers.

Semi-enclosed rewirable (damper type) patterns comply with B.S.3036:1958.





All units are arranged for internal fixing. Keyhole slots are provided at top. There are no external lugs.

H.R.C. cartridge patterns are interchangeable with semi-enclosed rewirable pattern and comply with B.S.88: 1952.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88: 1952, Appendix 'J' Dimensions, Form A-Offset Tags.

Ample wiring space and a detachable switchbar greatly facilitate the speed of wiring.

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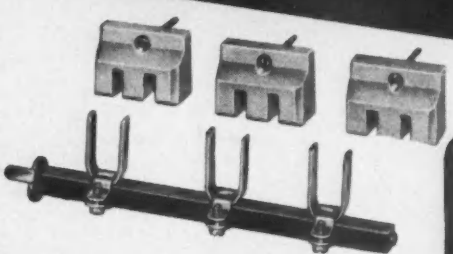

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 13 JULY, 1961

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K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

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Comment

MODELS FOR ECONOMY

Each year the report of the Building Research Station brings a batch of lively ideas on how the work of the building industry and the allied trades can be made more efficient. It is seldom that the electrical industry is not involved somewhere, and in one of the more interesting of this year's batch of projects, the benefits to electrical installation work could be considerable. The development being investigated is the use of models for study of the more complex parts of a building. A three-dimensional model is prepared and used to improve the design it represents, to ease the process of tendering and to help in the planning of erection work between the many specialist firms who may be engaged upon a single contract. If drawings always told the full story of a building design explicitly and quickly to all concerned there would be little advantage in a model. However, with the growing complexity of modern buildings, drawings all too often offer room for misunderstanding. From the electrical installation aspect, anything in the nature of a model technique should have the advantage of showing up strikingly the many cases where there is insufficient provision for electrical wiring and distribution gear; and it can give estimators a clearer idea of what the wiremen on site will be up against in the detailed work of installation. The Building Research Station is hopeful that this latter effect of models may be a means of bringing down tender prices, through simplification of the process of estimating, and hence a reduction in the margin for contingencies that needs to be included. This seems optimistic, since the lowest tender—the one accepted—so often includes some inadvertent under-estimating and this would become less likely. The more positive advantages of model work, however, remain to make it potentially worth while.

FOREIGN FIRMS IN RESEARCH ASSOCIATIONS

A policy decision taken by DSIR during recent months will enable foreign concerns to become members of co-operative research associations. This decision is stated baldly in the annual report of the Department's Industrial Grants Committee, with no extensive attempt at justification. It is surrounded by certain safeguards and, to some degree, it may operate to retain established links with South Africa now that she is no longer a member of the Commonwealth; but, on the whole, it does not seem a facility of which much use should be made. This is not a view offered in any surge of xenophobia; scientific and technological exchange are of well-proved value in securing advances in knowledge. However, the British co-operative research movement depends to a large extent on the close working of members in committee

to throw up common problems and to make mutual contributions to the solution of those problems, quite apart from the work undertaken in the laboratories an association operates. The strains of international competition are more severe than those of internal trade strife. The presence of foreign representatives on research committees could well induce reconsideration of the commercial prudence of revealing some perhaps self-accusatory experiences or an advance secured. Once that slide sets in, something most important will be lost from the idea of co-operative research. The admission of foreign firms is a matter primarily for individual associations, judging the matter by the advantage to their members, and the right of members to have their objections considered is safeguarded by DSIR. They should consider any proposals with due care.

ANOTHER PLANNING PROBLEM

At present, nuclear stations are sited on the basis that if anything should go wrong, so that radioactive gas might become released, then it must be practicable to get the nearby countryside evacuated speedily. No one can see anything likely to go wrong in this way, but the precaution is clearly a sensible one when no nuclear station of the size now being built has yet operated. In the simplest figures, the safety policy demands that there shall be no centre of population of 10,000 inhabitants nearer than five miles to the station and it becomes far more detailed than that for areas nearer the station. It now seems that trouble faces the CEGB on this point. Local authorities near nuclear stations are having to consider suggestions from central government authorities that they should use their planning powers to prevent any but the smallest development likely to raise population density above certain limits within a mile or two of the nuclear station. From their reported reactions, it is clear that they had not envisaged such a ban, and are undecided on how far they are willing to apply it. In the nature of the siting so far adopted the problem is not likely to become too serious for existing stations, but it has overtones of trouble for future stations. This is clearly going to be a new weapon for those who object to nuclear stations. Moreover, it raises the legally complicated question of loss of development value. All concerned must hope, now that this situation is coming into the open, that early experience with nuclear stations will permit relaxation on the present severe safety rules, perhaps through adoption of more compact designs that will make practicable enclosure of reactors against the gas-escape danger.

M.C.B'S *v.* FUSES

It is more than four years since controversy was raging in our pages about the dangers, if any, involved in using miniature circuit-breakers for the protection of sub-circuits. At the time, there was a demand for independent tests. This week we publish results of work by the ERA on the main basis of contention in that controversy, the heating effect of the current an m.c.b. allows to flow between fault initiation and circuit clearance. The results obtained are, on the whole, favourable for those who argued the case for the m.c.b., but, as became apparent in the original correspondence, much depends on what practical conditions are assumed. What is the prospective current to be expected on domestic premises, and what is the minimum length of cable likely to be in circuit? It seems clear that only a small range of cable sizes is at all at risk; and even more clear as the years have gone by and the use of m.c.b's has grown more widespread, that there is no growing evidence of trouble due to cable conductors melting. The m.c.b. has marched on to larger and larger ratings, where the fast-growing effect of cable cross-section rules out all danger of the conductor melting due to fault current let-through. Now it is making its mark in competition with the circuit-breaker of more conventional design for the control of industrial circuits of several hundreds of amps rating. The arguments that we carried in our pages four years ago were valuable in elucidating a possible weak point in a new technique and of defining its nature and limits. This week's echo suggests that any danger was minimal.

NUCLEAR IMPROVEMENT

In a year when the first CEGB nuclear stations are to start working, a welcome story of better-than-expected performance comes in the annual report of the UKAEA. Amidst the accounts of the research and development work in hand for the reactors of the future, the report gives space to the success story of Calder Hall and Chapelcross, the Authority's dual-purpose stations, in which electricity generation is coincidental to the manufacture of plutonium. The eight reactors involved are operating smoothly and have an output to the electricity supply network of almost 2,000 million kWh a year. As experience with them has grown, the heat output has been raised until it is now some 20% above the designed value. This has been achieved without adverse effect on fuel element life, by raising temperatures and by adjusting loading to even out temperature distribution. The time taken to replace fuel has also been cut down sharply to little more than one-third of that originally taken. The importance of this experience is the hope that something of the same improvement may be hoped for as the CEGB reactors are worked up to full load. It has always been considered that one of the hidden advantages of the gas-cooled, graphite-moderated system is its amenability to improvement by the application of known engineering techniques. The really big illustrations of this are seen in the designs of the consortia; but the marginal improvements which are possible even in the basic Calder Hall design are impressive and worth while as well.

Meteor

This week's quick summary of electrical news faces advertisement page 20

Circuit protection by m.c.b's

E.R.A. TESTS CHECK AMP²-SEC CRITERION

by H. W. Baxter, B.Sc., M.I.E.E.

MINIATURE circuit-breakers (abbreviated m.c.b.), the use of which is steadily expanding, are now made by several reputable British manufacturers. They possess certain attractive features, namely, they are easily reset, can give a close degree of small overcurrent protection, and can be fitted with time-delay tripping devices.

In the early stages of their development m.c.b's were regarded, to some extent, as substitutes for the consumer's fuses; they have even been produced in the same dimensions as the fuses that they were intended to replace. There is still a tendency to compare the performance of the two types of protective gear, and some years ago a controversy arose because published articles and correspondence had stressed the fact that m.c.b's can, during operation under conditions of large overcurrent, liberate more ampere-squared seconds in a circuit than a fuse of similar current rating. This raised doubts in the minds of some users as to the suitability of m.c.b's for the short-circuit protection of certain circuits and the hope was expressed that an independent authority would investigate the matter.

Such an investigation was made by the Electrical Research Association and the relevant report* is now published. Before, however, considering the results obtained it is desirable to put the matter into perspective by considering the fuse with which the m.c.b. is frequently compared.

Fuse Characteristics

A fuse is a weak link in a circuit and, being thermally operated, its pre-arcing amp²-sec when it is blown rapidly are sensibly constant. A 15 A semi-enclosed fuse, for example, would be fitted with a wire of about No. 26 s.w.g., the cross-sectional area of which is less than one-tenth that of a 15 A (3/·036 in.) cable. If the ratio be taken as 10, the passage of a given number of amp²-sec through the fuse and cable in series will produce 100 (i.e., 10^2) times the temperature rise in the fuse wire as in the cable, provided that there is no significant increase in resistance. When a fuse blows, however, its resistance increases roughly sixfold, whereas that of the protected cable does not increase significantly; hence the figure of 100 must be multiplied by an appropriate factor. Allowance must, of course, be made for the amp²-sec passed by the fuse during arcing, but, even so, the amp²-sec passed by a well-designed fuse under short-circuit conditions are harmless to the cable. With a cartridge fuse, operating more quickly than the semi-enclosed type, the temperature rise of the cable on short-circuit is of the order of 1°C.

A fuse usually gives more than adequate thermal protection to a cable under conditions of large overcurrent,

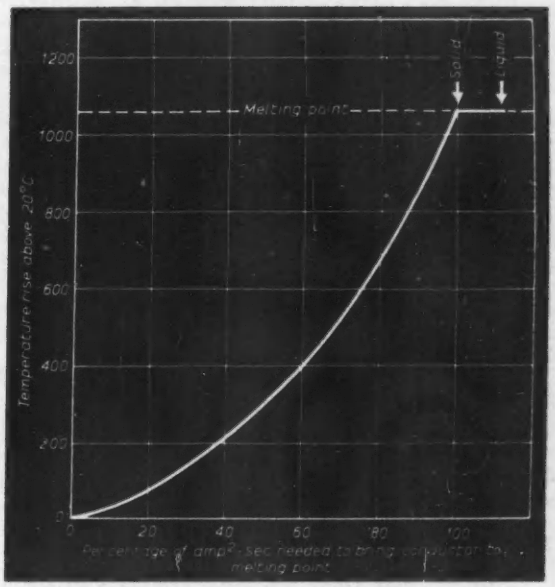


Fig. 1. Relationship between amp²-sec and temperature rise for a copper conductor

and the IEE Wiring Regulations (13th edition) permit over-fusing of motor circuits by 100% when the motor is fitted with thermal protection in order to avoid unwanted blowing of the fuse by the starting current.

The foregoing will, it is hoped, show that the amp²-sec passed by a fuse should not necessarily be taken as a criterion that must not be exceeded. Miniature circuit-breakers operating under conditions of large fault current usually pass more amp²-sec than a fuse of similar rating and, since there is a minimum operating time for a given m.c.b., the amp²-sec is not constant, but increases with the current. An attempt has been made to determine dangerous values of amp²-sec by fusing cables of various sizes by a current of 1,000 A to 2,000 A and measuring the amp²-sec up to the instant at which fusion occurred. The results are given in the first five lines of Table 1, the remaining values being calculated. The measured values, which agree well with calculated values, are substantially proportional to the square of the cross-sectional area of the cable.

The temperature rise of a cable is not proportional to the amp²-sec, because of the increase of resistance of the cable with temperature, so it is difficult to say what is a safe upper limit. The relation is shown above, Fig. 1. The amp²-sec to raise the conductor to its melting point (solid state) are expressed as 100% and it will be seen that a reduction of amp²-sec of 50% reduces the temperature rise to 300°C. In order to fuse a cable already at its melting point, additional amp²-sec corresponding to the latent heat of fusion must be liberated to the extent of

*ERA report, ref. F/T197, entitled: "The Protection of Circuits by Miniature Circuit-breakers," by H. W. Baxter. Mr Baxter was formerly with the Electrical Research Association.

an extra 12%; for the present discussion this may conveniently be neglected.

The maximum value of amp²-sec that can be tolerated depends on the type of cable and on its cross-sectional area. A harmful transient temperature for one type of insulation may not be so harmful for another. The safe upper limit of amp²-sec is a debatable question that this article does not purport to answer.

Performance of M.C.B's

A number of m.c.b's of up to 30 A rating have been tested by the ERA and the results are contained in the afore-mentioned report. In the absence of an appropriate British Standard the maximum prospective current was fixed at 1,500 A, 0·8 p.f., these figures having been adopted in an international (CEE) specification.

Maximum amp²-sec occurred at the maximum current, decreasing rapidly as the current was reduced. Only the performance at 1,500 A prospective current is here considered. This is influenced by the instant at which the circuit is made. A major current loop may increase the amp²-sec, but not appreciably with a power factor of 0·8. On the other hand, if the contacts separate at current zero there may be no arcing. Both random and controlled switching were used and in the latter case the closing angle was chosen to give a symmetrical current, neglecting the impedance of the m.c.b. The results are summarised in Table 2.

The total operating times are not shown in the table but these corresponded to about one half cycle in roughly half the tests and, with one exception, between one and two half cycles in the remainder. In one test, current flowed for three half cycles, corresponding to the figure of 58,200 amp²-sec, in the last line of the table.

Table 1. Values of amp²-sec to fuse cables of various sizes

Cable	Cross-sectional area sq in.	Rating amp	Amp²-sec to cause fusion
			Measured
14/·0076	0·0006	2	16,000
23/·0076	0·001	5	42,000
40/·0076	0·0017	10	123,000
70/·0076	0·003	15	400,000
3/·036	0·003	15	360,000
			Calculated
1/·044	0·0015	5	90,000
3/·029	0·002	10	160,000
3/·036	0·003	15	360,000
7/·029	0·0045	20	810,000
7/·036	0·007	28	2,000,000
7/·044	0·01	36	4,000,000
7/·064	0·0225	53	20,000,000
19/·044	0·03	62	36,000,000
19/·064	0·06	97	144,000,000

Table 2. Summary of ERA test results at 1,500 A prospective current 0·8 p.f.

M.C.B. rating Amp	No. of makes tested	Impedance ohms Min.	Impedance ohms Max.	Total amp²-sec (pre-arcing and arcing) Min.	Total amp²-sec (pre-arcing and arcing) Max.	Approx. amp²-sec to fuse cable of similar rating
2½	4	0·32	0·94	390	7,600	16,000
5	7	0·01	0·11	7,280	22,200	42,000
10	4	0·01	0·05	15,400	28,000	120,000
15	7	0·01	0·03	17,500	32,800	400,000
20	2	0·01	0·02	12,000	26,200	800,000
30	4	0·01	0·01	17,200	58,200	2,000,000

Table 3. Half-cycle and one-cycle currents to fuse cables of various sizes

Rating	Nearest conductor size	Symmetrical r.m.s. current (amp) to fuse conductor in half-cycle	one cycle
Amp		Amp	Amp
2	14/·0076	1,300	900
5	1/·044	3,000	2,100
10	3/·029	4,000	2,800
15	3/·036	6,000	4,200
20	7/·029	9,000	6,300
30	7/·036	14,000	9,800
50	7/·064	45,000	32,000
60	19/·044	60,000	42,000
100	19/·064	120,000	85,000

Apart from the 2½ A m.c.b's, some of those of the other ratings tested were of only 0·01 ohms impedance. If, therefore, their operating times were the same, these low-impedance m.c.b's would all pass roughly the same amp²-sec at a given prospective current. Since, however, a 5 A cable has only about one-tenth the cross-sectional area of one of 30 A rating, the former would be subjected to about 100 times the heating. Even so, the figure of 22,200 amp²-sec recorded at 1,500 A for a 5 A m.c.b. is only about half the quantity required to fuse the 5 A cable. Danger could arise with a 2 A flexible cable† but this is unlikely if a 2½ A m.c.b. is used, because those tested had the relatively large internal impedance of 0·32 ohms to 0·94 ohms and could not damage the cable, even if used in a circuit of unlimited prospective current.

In the ERA tests the current, for the reason mentioned, was limited to 1,500 A. The use of m.c.b's in circuits of larger prospective currents is, however, envisaged and since the heating of a cable is proportional to the square of the current there is clearly a limit to the amount of current that a cable can safely carry for a given time. Table 3 shows the half-cycle and one-cycle symmetrical currents that will just fuse conductors of various sizes. The minimum length of cable required to limit the current to the one-cycle fusing value at 240 V, neglecting the impedance of the system and of the m.c.b., is approximately 7 yd for each size of cable.

Whether these currents would be reached in practice depends on the combined impedance of the circuit and the m.c.b. It would seem that the impedance of several makes of 2½ A m.c.b. is sufficient to limit the current to about 500 A at 250 V, which would not fuse a 2 A flexible cable in one cycle. A 5 A m.c.b. of only 0·01 ohm impedance would not have an appreciable effect in reducing the current below the prospective value and so there could be a likelihood of damage to a 5 A cable in circuits of prospective currents of more than 1,500 A, even though the breaking capacity of the m.c.b. might be adequate.

Serious trouble is unlikely to occur with m.c.b's of more than 15 A rating because fault currents exceeding 6,000 A seldom occur in domestic premises, although they could occur in some industrial premises. An allowance must, of course, be made for power factor and closing angle since a departure from current symmetry will increase the heating effect.

Conclusion

It is difficult to give general directions for the use of m.c.b's because any heating effect in the circuit depends on the operating time of the m.c.b. and on its internal impedance, if this latter is large enough materially to reduce the current below the prospective value. The criterion is the magnitude and duration of the current that is likely to flow in the associated cable. If the impedance of the m.c.b. is negligible there is clearly a limit to the prospective current of the circuit in which it can be used if the associated cable is to be undamaged under conditions of maximum fault current. Each m.c.b. should, in effect, be assigned a category of duty (in terms of prospective current) that will ensure that the cable it is intended to protect can never be damaged, subject, of course, to this being within the m.c.b's breaking capacity.

† It is worth while noting that the IEE regulations (13th edition, Reg. 108) permit a 2 A flexible cable used for a pendant to be protected by a 5 A fuse in a distribution board.

Electrical control of liquids

VOLTAGE VARIATION CHANGES ORIFICE DISCHARGE

by P. G. MORGAN, B.Sc.(Eng.)*

THE rate of flow of liquids through nozzles or orifices has a definite value under a given set of conditions, and is mainly dependent upon the head of the liquid causing flow, the geometry of the system and the properties of the fluid itself. The flow conditions may be considerably altered, however, if an electrical potential is applied to the orifice, and a brief description of the changes which may be produced is given below.

The phenomena may be observed most clearly in the passage of solid particles through an orifice subjected to a high voltage, as shown in Fig. 1. The particles become charged during their passage through the orifice and repel one another, so that upon leaving the orifice they form a spray, the angle of the spray increasing as the applied voltage is increased (Fig. 4). This has been demonstrated for silica sand, coal and other mineral powders, but the effect does not yet appear to have been applied for any industrial purpose.

Liquid Flow

Similar characteristics to the above are noted in the flow of liquid through an orifice. A heavy diesel oil which, due to its viscosity, does not flow continuously through a small orifice, can be made to discharge freely if the orifice is connected to a high-voltage supply. The mechanism of the increase in flow is as before, with the fluid particles becoming charged, repelling each other, and causing an increase of flow. The charge on the liquid jet may be observed by the bending of the jet which can be produced if it passes by an object placed near to it; the attraction between the charged particles and the body can distort the jet or even cause it to change into a fine spray (Fig. 2).

The effect of the alternating voltage can be observed by inserting a neon tube in the same circuit as the alternating supply voltage; this causes intermittent illumination of the falling jet, as with a stroboscope, and the nodes and antinodes corresponding to the frequency of the applied voltage can clearly be seen (Fig. 3). If the frequency of the supply is halved, the distance between successive nodes is approximately doubled, although there is a gradual increase in the distance between nodes due to gravitational effects. The width of the jet at the node, i.e., the position corresponding to zero potential, corresponds to that appropriate to the flow in the absence of electrical effects.

The application of a high potential to a liquid has been used in laboratory equipment to produce drops of uniform size. The flow of liquid through a finely drawn capillary tube is used to produce a series of drops of a given size, the factors determining the drop size being the radius of the capillary and the properties of the liquid. This method cannot be used to produce very small drops, however, due to the difficulty in obtaining accurately drawn capillary tubing; but if a high potential is applied to the liquid, i.e., of the order of a few thousand volts, the drops are extremely small and are expelled from the tip of the capillary tube with such a high velocity that they have the appearance of a continuous stream of liquid.

Theory

The surface of a spherical liquid of radius r, having an electric charge q, experiences an outward pressure $q^2/8\pi r^4$, which opposes the surface tension causing the drop to adhere to the tip. If the charge is sufficiently high the electrical effects dominate the surface tension forces and cause the detachment of the drop early in its formation. If the applied potential is sufficiently high, a fine spray of droplets issues from the capillary tip, a good example of

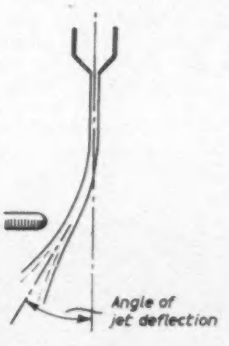


Fig. 2. Effect of nearby uncharged body

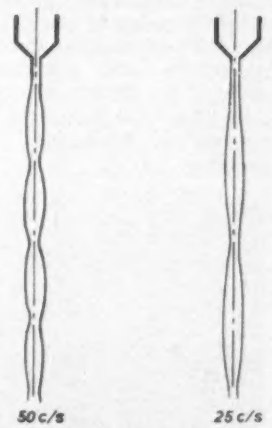


Fig. 3. Jet as seen under stroboscopic illumination

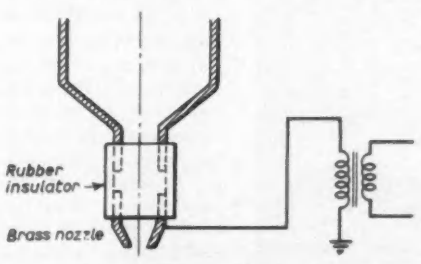


Fig. 1. Demonstration circuit

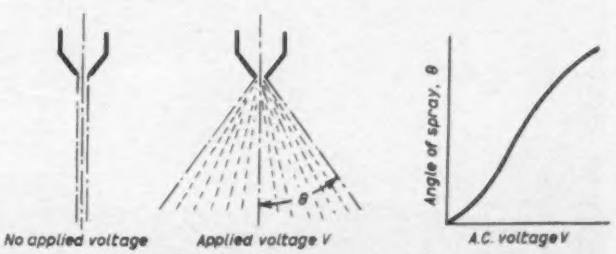


Fig. 4. Effect of voltage variation on solid particles

* Mr Morgan is lecturer in engineering at the University of Manchester.

the instability of an electrical liquid surface. The calculation of the distribution of charge over a liquid surface other than spherical is very difficult, but the equation $V^2=Cr\gamma$ gives the potential V at which instability begins. In this equation r is the radius of curvature at a point on the surface of the drop, γ is the surface tension of the liquid, and C is a constant which depends upon the shape of the drop and the way in which it changes. Thus, when the electric force at the liquid surface reaches a critical value, depending upon the surface tension and the radius of curvature of the surface, the surface becomes unstable and any slight disturbance is amplified. This condition is first reached at the lowest part of the drop where the electric intensity is greatest; the liquid there is pulled out into a fine thread which breaks up into minute droplets. The divergence of the droplets formed from the thread into the conical pattern (Fig. 4) appears to be due to changes in the direction of the electrical force acting on the thread as well as to the mutual repulsion of the charged droplets.

It would appear from the above phenomena that a considerable degree of control can be exerted over a certain flow phenomena for liquids and powdered solids, by the use of simple electrical systems. These introduce no restrictions to the flow in the form of baffles or valves, and thus introduce no additional pressure losses, and it may well be possible that, provided adequate safety precautions were adopted, the techniques described above might be used under industrial conditions. So far, little work has been done on the effect of electric charges on gas flow, but experiments similar to the above might prove to be of interest.

Highland Substation

TAYNUILT substation of the North of Scotland HE Board has been designed with special attention to the scenic beauty of the nearby countryside. Designed by the principal equipment suppliers, South Wales Switchgear Ltd., in collaboration with Merz and McLellan as consultants, the substation blends with its surroundings, as shown in our illustration below.

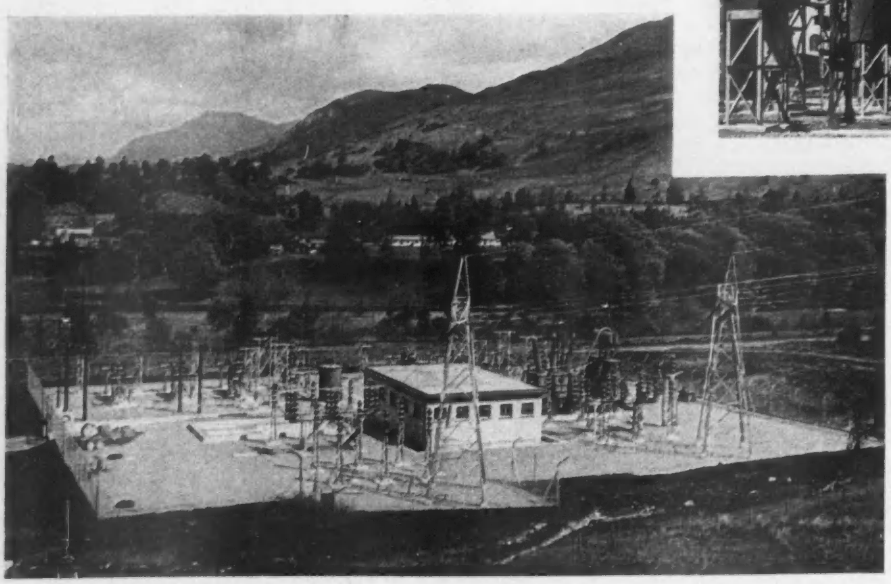
The station includes 33 kV, 500 MVA o.c.b's, voltage transformers and busbar structures and 132 kV air-break isolators and fault-throwing switches. A suite of 132 kV and 33 kV control and relay panels and an appropriate l.t. switchboard are also provided. South Wales Switchgear have also supplied and laid the complete station multi-core cabling and earthing system.

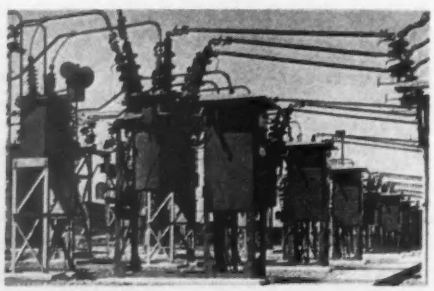
The layout at Taynuilt comprises a seven-circuit single-busbar arrangement. There are two 132 kV incoming transformer feeders and 20 MVA transformers, together with a 33 kV incoming feeder associated with the generating station under construction at Inverawe. Four outgoing 33 kV feeders provide reinforcement to the Oban, Connel and Clachan areas. Space has been left for the addition of bus-section o.c.b's and additional feeder circuits.

The o.c.b's used at Taynuilt are of the SWS EO1 type, being used for the first time by the HEB.

Inverawe

The Inverawe generating station will generate at 11 kV with step-up to 33 kV for the ¼-mile transmission to Taynuilt. The two 132 kV infeeds come some 15 miles over difficult country from the Inverary substation on Loch Fyne. Inverawe is part of the general Loch Awe development which, with Nant and Cruachan, including the pumped storage project, will involve an installed capacity of 450 MW. Inverawe itself will have one 25 MW set operating under 118 ft head and accepting water from a catchment area of about 324 sq miles. Its annual output is estimated to be 100 million units.





On the left is seen a general view of the SWS-designed Taynuilt substation. To the right are the foothills of 3,689 ft high Ben Cruachan, and in the background the Benderloch range. In the substation can be seen two of the incoming 132 kV line towers. To the left of the control room is the plinth for the second 20 MVA transformer, scheduled for 1962 commissioning. Above is a closer view of the SWS circuit-breakers used at the substation

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Representative's Call

YOU generally publish such an interesting and varied selection of letters that I was surprised to read that in the current issue from *Sales Representative*. I hasten to assure you and your many readers that the views expressed in that letter are certainly not those of the majority of representatives, who appreciate that their customers have other things to do besides see them when they happen to drop in. Besides that, it is common courtesy to phone, if not write, for an appointment; and if, as your correspondent says, the man in question was manager as well as buyer, then all the more reason to comply with the polite request and make an appointment.

H. H. Strangways,
LEAMINGTON SPA, WARWICKS.

Earthing Clamps

IN reply to the Manager of No. 1 Sub-Area, North Western Electricity Board (22 June), all I can say is that since the extensive recent survey of earthing clamps did not reveal anything as regards their life being impaired in any way, he must have had the mains department kept very busy prior to this survey. Up to 1953 there were numerous installations on the old corporation estates, especially in and around Withington, where I can truthfully say I have come across old installations where no bonding was carried on the loop services as stated in my previous letter. Also, earth clips had cracked across or corrosion had set in.

Regarding the service cable being used for earthing purposes under the former Manchester Corporation Electricity Department, I should say it started in the early 1930's and use was made of the service cable to earth the slot meters which, at that time, were in common use. Then, later orders came out for other types of meters to be earthed except where iron-clad cut-outs were installed. Later still, the electrical contractor was allowed to make use of the service cable for earthing.

The first earth clips used by the former MCED, to my knowledge, were made of copper, then afterwards use was made of brass earth clips. There have been numerous cases of these brass clips corroding and cracking right across. Later still another type of earth clip was brought out. This was made of brass and consisted of two parts with two nuts and bolts and spring washers. This type was brought out, so I was informed at the time, more or less to avoid the clip cracking as did the single type. Also, these clips did not conform to IEE Regulations because the nuts and bolts and washers were not made of non-corrosive material.

A. Dearden,
WINDHOEK,
S.W. AFRICA.

Aluminium Cable Prices

IN the third article by Mr. C. C. Barnes, entitled "Copper and Aluminium in Electric Cables" in your 25 May issue, I was surprised to see the opinion expressed that the price differential in favour of aluminium is not large enough to secure a widespread change from copper to aluminium. The changeover so far has been on the larger paper-insulated lead-sheathed cable as used by the area boards for power distribution. It should be remembered that one board has gone on record as saying that they saved £100,000 during a year as a result of using aluminium-cored cables. I was interested to see recently that a cable company has calculated that they have supplied over the years about half a million pounds worth of aluminium-cored cables to this same board.

My investigation into current prices of cables has shown that the type of cable supplied in this instance is about 4% cheaper than the equivalent copper cable: equivalent, that is, in current carrying capacity and identical in type, i.e., paper-insulated, lead-sheathed, steel-wire-armoured and hessian served.

Mr Barnes described the Soljdal cable which, to date, has been made plastics-insulated, plastics-bedded, armoured with aluminium and plastics-sheathed overall. This cable in the three-core version is about 10% cheaper than a three-core copper cable with paper insulation, and 15% cheaper than one with plastics insulation. The four-core Solidal cable with aluminium armour appears to cost 15% less than the corresponding copper/paper/lead/armour cable and 20% less than plastics-insulated copper cables with steel wire armour and plastics oversheath. If three-core Solidal with aluminium armour is used with the armour as the neutral conductor, as has now been done by three area boards, there is a price advantage of no less than 30% as compared with the four-core copper cable, paper-insulated, lead-sheathed and armoured. To achieve the full amount of this saving, it is necessary to adopt protective multiple earthing or to require the consumer to provide a separate earth.

Although the first Solidal cable has been in the ground for only two years it is significant that the engineers that made the first half dozen installations have already placed repeat orders, and positive plans to undertake manufacture are in hand with cable makers in four Continents. I believe that it will not be long before Solidal cables are in general use.

A. G. Thomas,
SALES DEVELOPMENT DIVISION,
ALCAN INDUSTRIES LTD.,
BANBURY.

The Right Equipment

UNDER this heading (22 June), Mr Giltrow complained he was unable to obtain a weatherproof 10 A switch fuse to cover small motors in the 1 h.p. to 5 h.p. range.

The answer, as far as Mr Giltrow is concerned, is readily available. The inclusion of the Dorman and Smith Loadmaster miniature circuit-breaker of 10 A rating, housed in a weatherproof fully-gasketted cast-iron enclosure and supplied as s.p. and n., d.p. or t.p. and n. provides a neat, space saving solution to the problem

T. Eastham,
DORMAN AND SMITH LTD.,
PRESTON, LANCS.

Marshalling by computer

EXPERIENCE AND OPERATION AT MARGAM

AT the Margam marshalling yards of BR Western Region, the routeing and speed of wagons are controlled by electronic computers in accordance with a prearranged programme. Points are operated electro-pneumatically and wagon speed is controlled by primary and secondary retarders to ensure that, irrespective of wagon loading, length of siding and other factors, the wagon, or wagons, buff up to the appropriate train at a speed sufficiently low to prevent damage.

Coastal Site

Margam yard is sited on the South Wales coast between Bridgend and Swansea. It adjoins the works of SCOW and covers an area of 178 acres which was at one time sand dunes. The yard was opened in April last year, and since then, although many problems have had to be overcome, some peculiar to the site, experience has shown that high marshalling rates with fewer personnel are attainable with the control system used. On average about 2,500 wagons are dealt with in a day, but up to 1,100 wagons have been marshalled in a single shift. Most of the electrical, electro-pneumatic and telephone equipment was supplied by AEI-GRS Ltd.

The yard has 12 reception sidings where incoming trains are held for marshalling. Here the destinations of the wagons in the train are used to prepare a cut schedule. Each cut, which may vary between one and several wagons, either loaded or unloaded, is telephoned to the control tower where it is recorded on punched tape. This tape is subsequently used to control the point settings in conjunction with a wagon axle counter.

When the marshalling yard controller is ready to deal with a train, the wagons are pushed over the yard hump by a diesel-electric shunting locomotive. The locomotive maintains a constant speed of either 1 or 1½ m.p.h. depending on head wind conditions. and other factors. As the wagons pass over the hump they accelerate to relatively high speeds on the down gradient, so providing a gap between cuts sufficiently long to enable point settings to be altered for the next cut destination. A feature of the shunting locomotives is a repeater signal in the cab which indicates whether normal or slow speed is required. The indicator is actuated by sensing heads on the locomotive at track level which pick up high frequency signals superimposed on the normal d.c. track circuits. Audible warning is also given and in addition, the driver has two-way radio-telephone communication with the control tower. A 60-line automatic telephone exchange gives access to the main line network boxes, and also to various points in the yard for the use of shunting staff. Each shunter also has a light-weight radio transmitter.

Retarder Function

Margam yard has 50 sorting sidings. Before any one wagon cut enters the selected siding it passes through primary and secondary retarders and through a maximum of six pairs of points. The function of the primary retarder is to ensure that the speed of consecutive cuts

Fig. 1. View by night of Margam yard with the hump summit in the foreground. Left is the control tower which is in radio-telephone contact with locomotives and points in the yard. The two primary retarders are visible with the eight secondary retarders in the background. At Margam there are 50 sorting sidings, each track-circuited and controlled by electro-pneumatically operated points

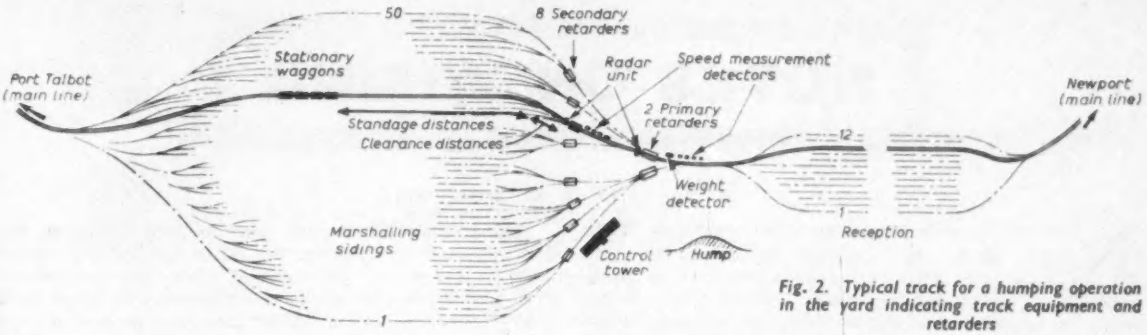


Fig. 2. Typical track for a humping operation in the yard indicating track equipment and retarders

is so controlled that a cut running well will not catch up on one running badly, and that a minimum of one track circuit length is maintained between cuts so that the necessary point changes can be made. One of the greatest difficulties to be overcome in automatic marshalling is to allow for the different rolling characteristics of wagons (rollability), which may be due, for example, to incorrectly adjusted brakes or the tendency of some wagons to run better round some curves than others.

The retarder consists of twin pairs of steel beams which are forced against the wagon wheels by pneumatic pressure. The pressure exerted varies up to 100 lb/sq in. and is controlled by a computer at a value proportional to the difference in actual wagon speed and the speed at which the wagon should leave the retarder as determined in accordance with four main variables. These are, the rolling ability of the cut, the maximum weight of wagon in it, the distance it has to run and the route curvature. Pressure is thus varied as the wagon cut progresses through the retarder and is limited to a maximum value depending on the weight of the heaviest wagon in the cut.

Limitation of maximum pressure is necessary to avoid a light wagon being squeezed out of the retarder. Even so, this can happen if a light wagon is included in the same cut as heavily loaded wagons, especially if it is the leading wagon. The cuts are subdivided into four groups by their weight as measured by the deflection of a rail head in front of the primary retarder. The deflection actuates micro-switches connected to stores in the computer.

Radar Speed Measurement

To ensure that the computed exit speed is maintained, the speed of the wagon as it approaches and passes through the retarder is continuously monitored by a Doppler radar unit. This equipment has its aerial mounted between the rails, and measures the speed by the difference in frequency between the transmitted radar beam and reflected beam which results from the cut speed. A crucial factor in deciding the exit speed of the wagon is its rolling characteristic. This is determined by measuring the times taken for the first axle of a cut to pass between two pairs of inductive detectors. A crystal oscillator-controlled counter measures the time for the axle to pass between two detector heads. By measuring the change in speed over the distance between detector pairs the rollability can be calculated by the computer and, from the further knowledge of the weight of the cut, it can work out the desired exit speed from the retarder. The exit speed from the primary retarder is selected by the computer to give a constant running time to the secondary retarder for different cuts. The secondary retarder selects the exit speed to give a safe buffing speed, generally about 4 m.p.h. when the cut strikes stationary wagons in the appropriate siding. To choose this speed, the computer uses information based on the measured rollability and weight of the cut, but it also takes into account the distance to be run and the curvature of the route.

The distance which the wagon has to run after leaving the secondary retarder consists of two parts, the clearance distance and the siding standage distance. Clearance distance varies for each siding and depends on the layout of the track. The standage distance depends on the length of the sorting siding and also on the number of wagons already in the siding. Track circuits pass this information to the computer, where it is stored on a modified type of uniselector with a potentiometer coupled to its shaft. Before shunting begins, these potentiometers are set to the free track length in the siding.

Control Tower

The yard control room is on the third floor of the control tower and gives the operator a view over the entire marshalling area. The lower floors house battery and relay rooms, the latter containing computing equipment.

Power for the equipment is normally received at 11 kV from the SCOW factory, through a 600 kVA substation adjacent to the control tower, with distribution at 415 V, 3-phase.

Mains failure standby plant, in an annexe to the control tower, comprises a diesel-alternator set rated 250 kVA with automatic starting equipment.

The control panel governs all movements in and out of the reception sidings and also the points, signals and retarders associated with the humping operations. When humping begins, the punched tape of the cut programme is fed into a tape reader which sets up the first four cuts in a storage section on the yard mimic control panel and these appear as illuminated figures on the panel. Later cuts are progressively fed into this store as humping proceeds. When a route is selected it is indicated by a white strip of lights which change to red as the humped wagons pass over it. The retarders and points are normally under the automatic control of the tape reader but if necessary the operator can intervene by using switches on the mimic diagram. For the reception sidings type NX route relay interlocking is in use for the selection of particular routes required, a rotary switch being placed at each route entrance and a push-button at the route exit. Running signals are of the multiple aspect type with low and high level position signals where required. A special signal is also placed at the top of the hump to indicate humping speed to the shunting locomotive driver.

To facilitate night working, the yards and access roads have been comprehensively floodlit.

NOTES ON WIRING

BY MEGOHM

NEW buildings are a familiar sight in most big towns these days. In London in particular, the "skyscraper" type of buildings seem to be rising everywhere. The building trade, and its allied trades too, must be in a contented mood with this full programme on its plate. However, I do hear an occasional moan from time to time and rather a strange one reached my ears only the other day. I have said a few rude things about architects in the past but this person, an electrical contractor, really went to town about these learned gentlemen.

It would appear that an eleven-storey block of offices had been built close to my acquaintance's place of business and, as we are all inclined to do, he watched its progress and, in time, learned who had designed it and what type of electrical installation was specified, and who planned it. The building was completed and the tenants took over. Then an electrical contractor's sign-board went up, a different one from that which had been displayed during the building period, and work began on adapting the original electrical installation to suit the tenants' requirements. According to my informant, this was a major exercise and a costly one.

It was then that the architect was criticised, because he had planned the original electrical installation which had been later proved to be of little use to the tenant, and it had been designed in a way that made it unsuitable for easy adaptation. Two similar cases in other parts of London were mentioned, one of which was dealt with by the man who told me all this.

To get right down to brass tacks, none of us are in this electrical business for health reasons. We do it to earn money and to many people such a happening as described above means "work." But here is a contractor who has a conscience and I back him up to the hilt. Electrical installations are far too complicated these days just to be marked up on a drawing and planned just to cover the bare needs of lighting and power. Manufacturers have gone to great lengths to develop their products to allow for flexibility in the electrical system due to alterations in internal planning of buildings, but it still requires the man with the "know-how" to achieve the desired results. I wonder how many more buildings have been similarly dealt with?

Trunking

Yet another make of trunking has made its appearance on the market. Each new trunking product seems to have something new to recommend its use and this one is no exception. In this instance, a detachable bridge is the novel idea and this fits on to the coupling pieces used to join the lengths of trunking together. The coupling piece has return edges and fits inside the trunking, thus allowing the trunking sections to butt up to each other and be fixed onto the coupling piece by means of nuts and bolts. The bridge, which is made up of two pieces of metal welded together in such a way that a groove is formed on each edge, is then slid onto the return edges. Two tapped holes are left in each bridge so that the lid can be fitted tightly. This arrangement gives additional rigidity to the trunking and fittings and also retains the cables in the trunking when it is fitted to a ceiling.

This arrangement is also used to good effect on the firm's flush floor trunking, the lid in this instance being fixed to flanges on the trunking edge. The bridges are sited where two lids are butted together thus ensuring a solid job at the joints. Cables can thus be laid in and the bridges placed in position later. The lid of the trunking can be obtained in a chequer plate finish or recessed type tray finish to receive concrete, composition or tile floor finishes.

The trunking is well made and reasonable in price.

Telephone Outlet

I was shown a sample of a telephone outlet recently which although fairly simple in design, struck me as being a very useful accessory indeed. This is for use on internal telephone systems and I trust that Post Office engineers will get around to using it in new buildings. (They may do so in certain places, but not where I have been involved!) This outlet has a specially designed block with 12 standard pattern PO terminal plates fitted to the plate. Each terminal plate has two cheese-head screws and washers. An integral bush protrudes through the plate and is supplied with a $\frac{1}{2}$ in. diameter hole which can be increased in diameter up to $\frac{3}{4}$ in., and a bevelled edge is still left to prevent abrasion of the cable sheath. A really useful accessory indeed.

Still on the subject of telephone outlets, the same firm market boxes to house the old and new type telephone connector boxes. Also a 2 in. circular box with a 4 pole connector plate fitted therein. I repeat, I hope that the PO engineers note that such boxes are available and that we engineers would be only too pleased to co-operate by installing them in buildings so that a neat finish could be achieved.

Safety Testing

The recent announcement that the South Western EB would soon offer to their consumers a comprehensive test of installations is a good sign indeed. Their proposed test is concerned with safety, and for 30s the installation and appliances will be fully tested and reported upon and a quotation given for any repairs found necessary.

Of course, there are numerous difficulties to be faced and I feel certain that many consumers will take little notice of the scheme or dismiss it as being an attempt to obtain work. There will be others who wish to let nobody see their installation because some friend—or they themselves—have been busy adding points here and there.

I feel that the ambitious, and stout-hearted, promoters of this scheme must hammer away at these closed doors by advertising their service in no uncertain manner. The benefits of the scheme should be made clear, not only from the point of safety, but in every other way possible. For instance, a consumer who was selling his house could produce proof that the electrical installation was in order. Likewise, a prospective buyer could be assured that he was, at least, getting a safe installation and would not be faced with repair bills as soon as he moved in. I wish the scheme every success and trust that the idea spreads.

Reactor development progress

U.K.A.E.A. REPORT FOR 1960-61

PROGRESS with development of nuclear reactors for electrical power production is dealt with at length in the annual report of the UK Atomic Energy Authority for 1960-61, published this week. There are no major developments announced; most of the work is concentrated on the various gas cooled reactors, and on the fast breeder reactor, with the prospect of a move to experiment on a heavy-water moderated, steam-generating reactor. Thermonuclear work remains enmeshed in theoretical uncertainties that preclude advance to anything approaching power producing plans. On the business side of the Authority's activities, there has been a 10% increase in sales of isotopes that has taken the value of UKAEA sales to nearly £21 million in 1960-61.

So far as the now familiar magnox reactor is concerned, attention to detail has continued in preparation for the start-up of the CEGB reactors. An example of the type of work being carried out is a determination of the effect of build-up of plutonium in the reactor fuel during its operational life. Calculation and experiment have confirmed earlier beliefs, that the control systems designed for the electricity generating stations will ensure adequate operational stability despite the temperature - related reactivity changes that plutonium introduces. Another reassuring result relates to graphite and the Wigner energy problem. It was feared at one time that this might present difficulties in generating stations, but more recent experimental work has shown that this is, in fact, not so.

AGR Project

After the magnox type reactor the Authority envisage electricity generation being based on advanced gas cooled reactors, in which higher gas temperatures are used. The basis of design is use of uranium oxide as a fuel with graphite and CO_2 as moderator and coolant. Cans for fuel elements would be beryllium, and a considerable degree of enrichment of the uranium fuel with U 235 would be necessary. A 30 MW prototype is being built at Windscale, with fuel loading due to begin next month.

A number of difficulties are arising in the AGR development. The present report notes that the chemical reaction between graphite and CO_2 could reach significant proportions under the effect of irradiation at temperatures envisaged for AGR. Some of the graphite is eaten away from the reactor core due to attack by oxygen released when CO_2 is decomposed. Small additions of carbon monoxide to the CO_2 seem to reduce the loss; and use of imporous graphite helps.

AGR fuel element canning based on beryllium is also causing some difficulty. Tests on the corrosion of beryllium by CO_2 have shown it to be higher than can be tolerated. For this reason, less use is being made of beryllium canning in the early fuel charges for the Windscale AGR than had been expected. Stainless steel clad elements are to be used instead, although they are not so good from the neutron economy point of view. On the other hand, fears about distortion of beryllium due to certain nuclear reactions which can take place in it under the effect of irradiation have been shown to be unjustified.

A design study for a power producing AGR has made progress. One of the advantages is the relatively small size compared with a magnox reactor. This might make it possible to provide containment for the reactor as a precaution against release of radioactive gas if anything should go wrong, at a cost which was practicable. In the words of the report "it may prove possible to advise that the siting restrictions applicable to magnox stations could be relaxed for AGR civil stations."

Long-term Designs

Dounreay, where the fast breeder reactor work is centred, was the scene of much activity during the year. The trouble that has been experienced with some aspects of the reactor design have themselves contributed to the growing stock of knowledge on fast reactor technology. The next stage in fast reactor development is intended to be a plant which can provide a basis for design of commercial fast reactors. During 1960, work on this project was carried to the stage where the effect on cost of power of important design factors was determined.

Further ahead in the future comes the high temperature gas cooled (HTGC) reactor using helium as a coolant gas and dispensing with metals in the core. The fuel would be highly-enriched U235 dispersed in graphite. Most of the UKAEA work is being done in support of the 20 MW (heat) Dragon project, an international venture under OEEC auspices towards which the Authority are likely to contribute almost 60% of the cost. One of the technical problems with a HTGC reactor is design of the blower to deal with the hot gas. UKAEA experience with gas bearings and seals is expected to be particularly valuable here. The Authority is also giving attention to a possible plutonium/thorium/uranium 233 cycle.

Finally, in the reactor systems actively under study comes the steam generating heavy water reactor (SGHW). The report says "the Authority are now engaged on solving some of the key problems." Some of these are the same for any heavy water moderated reactor, and so a development programme is being carried out in conjunction with Atomic Energy of Canada Ltd. The report says that the Authority has not yet taken a decision whether to construct a reactor experiment.

It has been determined that stability problems arising from the boiling action to be permitted in the light water in the reactor should not limit power available from a SGHW reactor. However, a major mechanical problem emerging is that of jointing zirconium pressure tubes which carry the coolant through the core, to a stainless steel header. The two metals have different coefficients of thermal expansion.

The report makes particular comment on the steady improvement in performance obtained with the Calder Hall and Chapelcross reactors. Gross heat output has been brought to 20% above design.

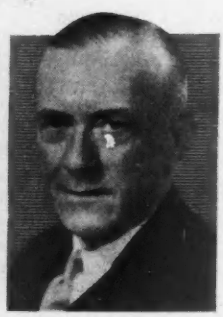
Personalities *in the industry*

Mr R. Houghton

Mr N. Robinson

Sir Thomas Eades

Mr A. Roger



Mr G. D. Christie

The newly appointed station superintendent at Westwood power station, North Western Region, CEGB, is **Mr Roy Houghton,** B.A.(HONS.)CANTAB., A.M.I.MECH.E., A.M.I.E.E., A.M.C.T., who has been development and planning engineer at Agecroft since October, 1959 (*ESH, page 74). Mr Houghton, who was educated at The Queen Elizabeth Grammar School, Blackburn and King's College, Cambridge, joined the Region as a graduate trainee in August, 1950, and continued his studies at the Manchester College of Technology. In 1952 he was appointed junior engineer at Westwood. Subsequent appointments included station shift control engineer, assistant shift charge engineer and charge engineer, serving in these capacities at Barton power station before being transferred to Ince in 1957 as charge engineer. He moved to Agecroft in 1959.

Lord Brabazon has agreed to be president of the Radio Industry Council for another year.

Chosen for the new post of assistant director of the Electrical Development Association is **Mr Neville Robinson,** who has been deputy controller of publicity to the General Electric Co. since last year. He takes up his new duties in September. Educated at King Edward's School, Birmingham, he began his career in the marketing field with Cadbury Brothers. In 1936 he joined the Radiation group in Birmingham and organised the Statistical and Sales Research Unit. He served in the RAF and, in 1942, was posted to the Planning Directorate in the Air Ministry (AMSO). On demobilisation he worked in market research and, in 1947, became the Mather and Crowther executive for a group of electricity accounts including EDA, British Electricity and the South Western Electricity Board. He was advertising manager of Union International Ltd. from 1955 until last year when he was appointed deputy controller of publicity at the GEC.

Managing director of Digital Engineering Co. since it started in 1956, **Dr L. N. Bramley,** takes up a full-time appointment in that capacity as from 1 Sept., following the acquisition of the company by Allen West and Co. Ltd. His colleague, **Mr W. N. Jenkins,** the other original director of the company, is being retained as a consultant. **Mr G. H. Cann,** M.B.E., F.C.A., becomes chairman of Digital Engineering, and also joining the board of the subsidiary company from Allen West and Co. are **Mr V. L. Breeze** (deputy managing director), **Mr J. Meares** (secretary) and two senior engineers, **Mr J. R. Stacey** and **Mr F. W. White.**

Joint editor of the ELECTRICAL TIMES, **Mr K. C. Pounds,** B.SC.(ENG.), A.C.G.I., A.M.I.E.E., has been appointed a director of Electrical Times Ltd.

After 49 years' service with the company, **Sir Thomas Eades,** F.C.I.S., F.R.S.A., F.B.I.M., has relinquished his position as chairman and has resigned from the board of Automatic Telephone and Electric Co. Ltd. He has accepted the appointment of honorary president of the company. **Mr Alastair Roger,** who has been elected to succeed Sir Thomas as chairman, has been a member of the board for six years, and is chairman of Telephone and General Trust. In addition, **Mr G. D. Christie,** B.COM., financial director of ATE, has been appointed managing director in place of **Mr C. O. Boyse** (whose return to BICC we note on page 47). It is also announced that **Mr A. F. Bennett,** C.B.E., M.I.E.E., has retired from the board of Automatic Telephone and Electric Co. Ltd., of which he was joint general manager from 1947 to 1953.

Previously deputy station superintendent at Fulham power station, South Eastern Region, CEGB, **Mr M. B. Wood,** B.SC.(ENG.), A.M.I.E.E., has been appointed station superintendent at Lombard Rd power station. To succeed him at Fulham, **Mr R. J. Webster,** A.M.I.E.E., has been promoted from the position of turbine house superintendent there. The new station superintendent at Woolwich power station is **Mr E. C. Wilkinson,** who was previously deputy station superintendent at Deptford West (*ESH, page 57). The latter position is now taken over by **Mr F. J. Barker,** who also continues in a similar capacity for Deptford East.

Alderman W. H. Belliss, C.B.E., T.D., LL.B., has been elected chairman of Heyes and Co. Ltd. He has been associated with that company for over 30 years, and is also a director of other concerns. **Mrs M. H. Redmond** continues as governing director of Heyes and Co. Ltd., with **Mr R. S. Redmond** as managing director and **Mr N. F. Brand** as technical director. Ald Belliss has been a member of Southport Borough Council since 1928, and was mayor in 1931-32.

Air Chief Marshal Sir Francis Fogarty, G.B.E., K.C.B., D.F.C., A.F.C., has been appointed to the board of Racal Instruments Ltd.

Formerly managing director of Hurseal Ltd., **Mr A. C. Hazel** has now become joint managing director (sales) of the newly formed company, Powell Duffryn Heating Ltd., to which we referred last week. This new company is now operating the businesses previously conducted by Hurseal Ltd., Gulf Radiators Ltd., Janitor Boilers Ltd. and Powell Duffryn Modulair Ltd.

Mr J. A. V. Watson, O.B.E., will be appointed assistant managing director of Castrol Industrial Ltd. upon the retirement of **Mr W. F. List** on 1 Jan., 1962.

**Denotes revision to the "Electricity Supply Handbook, 1961."*

Mr Watson's appointment as an assistant managing director of the parent company Castrol Ltd., to take effect on the same date, has already been announced.

Formerly technical supervisor of the Sound Equipment Division of the GEC Radio Group, **Mr F. Poperwell** has joined the Derritron Electronics Group as group technical sales supervisor. During his 35 years' service with the GEC he has become well known in the p.a. and sound equipment fields. In 1945 he was appointed engineer in charge of their Radio Department's Sound Equipment Section and, during later reorganisation remained senior engineer.

Capt A. R. Glen has been elected a director of Nigerian Electricity Supply Corporation Ltd.

Managing director of Yorkshire Imperial Metals Ltd., **Mr H. F. Sherborne,** M.C., M.I.MAR.E., COMP. I.E.E., COMP. I.MECH.E., has been appointed president of the British Non-Ferrous Metals Research Association.

Mr David H. Bramley, M.I.MECH.E., M.I.PROD.E., M.B.I.M., has been appointed production director of Geo. Salter and Co. Ltd., in succession to **Mr P. P. C. Drabble** who is retiring at the end of July.

Servomex Controls Ltd. announce the appointment of **Mr C. Harman** as their engineering representative in N.W. England.

Sir John Cockcroft has been re-elected president of the Institute of Physics and the Physical Society.

Previously with Ada (Halifax) Ltd., **Mr R. W. Beer** has joined Sunbeam Electric Ltd. as area manager for South Wales and South West of England.

Mr J. T. McCarley has been appointed managing director of the British Division of the Yale and Towne Manufacturing Co. in succession to **Mr J. O. Sewell,** who has resigned his position in order to accept an executive post with a prominent British company. Mr McCarley joined Yale and Towne in 1936 in Detroit, and has subsequently gained broad experience in engineering, production planning, manufacturing and sales.

Formerly managing director of Automatic Telephone and Electric Co. Ltd., **Mr C. O. Boyse,** B.SC.(ENG.), M.I.C.E., M.I.E.E., M.I.STRUCT.E., FEL.AM.I.E.E., has relinquished that position to return to British Insulated Callender's Cables Ltd. as an executive director, responsible for the operation of certain group companies other than those primarily engaged on cable making. He has been a director of BICC since 1956. Mr Boyse has been managing director of ATE since January, 1957, but prior to that he was director and general manager of BI Callender's Construction Co. for seven years, after being chief civil engineer to BI Callender's Cables Ltd. from 1945 to 1948. He has been actively concerned in overhead line research problems and, in 1943, the IEE John Snell Premium was awarded to him and a colleague as joint authors of the paper "The Problem of Conductor Sagging on Overhead Transmission Lines."

The General Electric Co. Ltd. have appointed two more directors of GEC (Domestic Equipment) Ltd. They are **Mr N. J. Winnett** as production director, and **Mr C. M. Stephens** as financial director. Mr Winnett was previously manager of the Swinton Works of the company. Mr Stephens will be released from his position as accountant to the Attwood group of companies on 21 Aug. to take up his new post. These two appointments complete the construction of the board, which has **Mr C. F. Richards** as managing director, **Mr D. A. Reader** as marketing director and general manager, and **Mr J. G. Shooter** as secretary.

Deputy chief engineer of the Midlands Electricity Board since 1951, **Mr R. A. York,** B.SC., M.I.E.E., has been appointed chief engineer of the East Midlands Electricity Board. He will succeed **Mr A. G. Connell,** M.I.E.E., M.I.MECH.E., F.INST.F., who is to retire at the end of November (*ESH, pages 113, 121). Mr York served with the Midland Electric Corporation for Power Distribution Ltd. from 1936 to 1948, when he became sub-area engineer of the S. Staffs and N. Worcs sub-area.

Formerly chief development engineer responsible for the expansion of research and development strength and facilities at the English Electric Co.'s Whetstone Works, **Mr R. H. Davies,** M.A., B.SC., A.INST.P., has been appointed deputy general manager (Liverpool) of the company's Domestic Appliances Division.

Among the recent awards under the Royal Society and Nuffield Foundation Commonwealth Bursaries Scheme, is one to **Prof D. Walker,** professor of physics, Victoria University of Wellington, to enable him to make a study of experimental research work currently of interest to workers with low energy Van de Graaff accelerators (or similar machines), and to study the working of the National Institute for Nuclear Science in Britain, for eight months from June, 1962.

Mr Aubrey Buxton has been appointed chairman of Multisignals, the relay television company formed in 1959 by Thorn Electrical Industries, E. K. Cole, Anglia Television and Ultra Electric. Granada TV Network is now also a member of the group. Mr Buxton is executive director of Anglia Television.

Formerly sales manager of Pinchin Johnson and Co. Ltd., **Mr P. Y. Moyse** has been appointed general manager of the company. He joined the company in 1934 and served a three-year indentured apprenticeship at Minerva works, Silvertown. This training was followed by a further period of two years in the laboratories. Later he was transferred to Manchester as a technical sales representative for a two-year period. At the age of 27 he was appointed Manchester area manager. He returned to London in 1956 to take up his appointment as sales manager. Mr Moyse is a member of the Institute of Marketing and Sales Management, a member of the Institute of Metal Finishing and a member of the Oil and Colour Chemists' Association.

Mr W. Bamford and **Mr B. E. Newman** have been elected directors, and **Mr J. B. Johnston** appointed secretary of the Infra Red Development Co. (one of the

Mr J. T. McCarley

Mr C. O. Boyse

Mr P. Y. Moyse

Mr R. A. York

Mr R. H. Davies

Hilger and Watts group). The company's sales manager, **Mr P. Walduck** has also transferred his sales office to 98 St. Pancras Way, N.W.1.

On his retirement as district manager at Aylesbury to the Eastern Electricity Board, **Mr F. Bent,** M.I.E.E., A.M.I.MECH.E., has been the recipient of many presentations from colleagues and friends and was also recently presented with a testimonial by **Mr H. V. Pugh,** chairman of the Board. Mr Bent first went to Aylesbury in 1929, was appointed deputy borough electrical engineer five years later and chief in 1937.

Mr A. G. Crossland has been appointed a managing director of R. and A. G. Crossland Ltd.

Sir Josiah Eccles, deputy chairman of the Electricity Council, has accepted an invitation to attend an Electric Power Seminar to be held in Mexico City from 31 July to 12 Aug. next. The Seminar is being held under the auspices of the United Nations Economic Commission for Latin America (UNECLA) in conjunction with the Government of Mexico. Sir Josiah will present two papers on "Basic problems in electric power development" and "Operational and Institutional problems of electric power development."

Sir Andrew Cohen has been appointed the first Director-General of the new Department for Technical Co-operation. Headquarters of the department will be at Carlton Hse Terrace.

Mr G. M. Inglis has joined the Export Sales Department of Midland Silicones Ltd., and will be primarily concerned with sales in Australasia, India and South Africa.

Dr A. S. Eklund, of Sweden, has accepted the appointment by the Board of Governors of the International Atomic Energy Agency (IAEA) to the post of the Agency's Director-General, subject to the approval by the IAEA's general conference.

MK Electric Ltd. have appointed **Mr D. V. A. Walker** as sales representative for the Eastern Counties area. For many years he represented the GEC in the London area.

The end of this week brings the retirement of **Mr A. D. Hegan,** B.SC., M.I.E.E., from the position of district manager at Crewe to the Merseyside and North Wales Electricity Board. His successor is **Mr A. W. W. Hawley,** A.M.I.E.E., as we have already reported (*ESH, page 139). Mr Hegan has served at Crewe since 1927 when he joined the Corporation electricity undertaking as distribution engineer. He became chief engineer and manager there in 1935, holding that position until vesting day.

Mr R. A. Marryat has been appointed president of the EIBA for the ensuing year. **Sir Robertson King** has been re-elected chairman of the Court, with **Mr M. R. Neville** again as vice-chairman.

Mr J. Diamond, of the Radio Wholesalers Federation, has been elected president of the Federation of Wholesale Organisations. The vice-president is **Mr P. B. Etheridge,** secretary of the Electrical Wholesalers Federation.

Mr W. G. Jordan, technical assistant with the BEAMA at Ascot, has retired at the age of 65. To mark the occasion he was the recipient of presentations on behalf of member firms and his staff colleagues. He joined BEAMA in 1939, following experience with BTH and Crompton's.

OBITUARY

Mr H. V. Griffiths, M.B.E., F.R.A.S., S.M.I.R.E., engineer in charge of the BBC's Measurement and Receiving Station at Tatsfield, died on 28 June, aged 59.

Mr G. O. Donovan, M.I.E.E., a former governing director of Donovan Electrical Co. Ltd., died on 6 July, aged 91.

Mr W. Y. Lewis, M.I.MECH.E., M.I.E.E., A.M.INST.C.E., who was managing director of the British Niclause Boiler Co. Ltd. for many years, died on 7 July.

Mr T. H. Martin-Harvey, A.M.I.E.E., formerly chairman of the Metropolitan Electric Cable and Construction Co. Ltd., died on 9 July, aged 83.

I.E.E. COUNCIL AND CHAIRMEN

Mr G. S. C. Lucas

THE Institution of Electrical Engineers have now announced the constitution of the Council, the various Section Committees and the names of the chairmen of the Local Centres elected for the session commencing 30 Sept. next. These are as follows:

President: *G. S. C. Lucas,* O.B.E., F.C.G.I., (director and chief engineer, Associated Electrical Industries (Rugby) Ltd.).

New Vice-Presidents: *A. H. Mumford,* O.B.E., B.SC.(ENG.); and *R. L. Smith-Rose,* C.B.E., D.SC., PH.D., F.C.G.I.

Hon. Treasurer: *C. E. Strong,* O.B.E., B.A., B.A.I.

Ordinary Members of Council: *Sir Robert Cockburn,* K.B.E., C.B., M.SC., PH.D.; *J. S. McPetrie,* C.B., PH.D., D.SC.; *Prof C. W. Oatley,* O.B.E., M.A., M.SC.; and *H. West,* M.SC.

Associate Members: *J. Brown,* M.A., PH.D., D.SC.; and *P. L. Taylor,* M.A.

Companion: *Rt Hon the Viscount Falmouth.*

The election of Dr R. L. Smith-Rose as a vice-president has created a casual vacancy among the Ordinary Members of Council for the unexpired part of his term of office as an Ordinary Member. Mr G. Millington, M.A., B.SC., has been appointed to fill that vacancy.

New Chairmen of the Sections are: Measurement and Control—*W. S. Elliott,* M.A.; Supply—*J. S. Forrest,* D.SC., M.A.; Electronics and Communications—*R. J. Halsey,* C.M.G., B.SC.(ENG.), F.C.G.I.; and Utilisation—*H. G. Taylor,* D.SC.(ENG.).

Chairmen of the Local Centres are: Scottish—*Prof E. G. Cullwick,* O.B.E., M.A., D.SC.; North Western—*C. H. Flurscheim,* B.A.; South Midland—*C. F. Freeman,* B.SC.(ENG.); North Midland—*W. J. A. Painter*; East Midland—*Prof J. E. Parton,* B.SC., PH.D.; Mersey and N. Wales—*R. N. Pegg*; Western—*T. Gill,* B.SC.; Southern—*T. G. C. Harrop,* M.B.E.; North Eastern—*P. Richardson*; and Northern Ireland—*W. Szwander,* DIPL.ING.

Sections—With R. J. Halsey as chairman, the **Electronics and Communications Section** will have *J. A. Ratcliffe,* C.B.E., M.A., F.R.S., as vice-chairman, with new ordinary members of commitee: *V. J. Cooper,* B.SC.(ENG.); *H. Davies,* M.ENG.; *G. W. A. Dummer,* M.B.E.; *R. Feinberg,* DR. ING., M.SC.; *C. A. Marshall,* B.SC.; and *R. C. G. Williams,* PH.D., B.SC.(ENG.).

The **Measurement and Control Section** has *W. S. Elliott,* M.A., as chairman; *A. C. Lynch,* M.A., B.SC., as vice-chairman; and new ordinary members of committee: *W. H. Devenish, H. M. Gale,* B.SC.(ENG.), and *E. J. R. Hardy,* B.SC.(ENG.).

For the **Supply Section,** with *J. S. Forrest* as chairman, the new vice-chairmen are: *D. T. Hollingsworth* and *D. B. Irving,* B.SC.; with new ordinary members of committee: *L. D. Anscombe,* M.A.; *W. H. Dunkley,* B.SC.(ENG.); *J. D. Nicholson,* B.SC.; and *V. J. Vickers,* B.SC.(ENG.).

The **Utilisation Section Committee,** with *H. G. Taylor* as chairman, the two new vice-chairmen are: *R. F. Richardson,* M.B.E., and *C. D. Wilkinson*; and new ordinary members of committee are: *D. Gray,* B.SC.; *J. Hamilton,* M.ENG.; *E. R. Laithwaite,* M.SC., PH.D.; *W. J. Outram,* M.ENG.; and *T. S. Pick,* B.SC.(ENG.).

Power at the U.S.S.R. exhibition

DISPLAY EMPHASISES 500 kV SYSTEMS

CHIMNEYS as pylons, prefabricated construction for large power stations, a suction water turbine with the runner at dam crest level. If the engineer visiting the USSR industrial exhibition has any capacity for surprise left after passing through the first six halls, he will certainly notice these three unusual exhibits. The exhibition, staged in 22 halls on the ground floor at Earls Court, deals progressively with science, through engineering and industry, to cultural activities. The first 13 halls are concerned primarily with science and industry.

The exhibition was opened last Friday by Mr N. S. Patolichev, USSR Minister of Foreign Trade, and remains open daily from 10 a.m. to 10 p.m. until 29 July.

The power engineering hall is dominated by full-size equipment for the 500 kV Moscow-Kuibyshev line and includes an air-blast circuit-breaker and a surge diverter. From these impressive pieces of equipment the visitor can turn to some remarkably familiar-looking induction motors similar, at least in appearance, to well-known British makes. In the mining section, too, the electrical engineer will feel at home, for the Russian flameproofing seems to favour British construction techniques.

500 kV Circuit-breaker

The 500 kV air-blast circuit-breaker, centrepiece of the power display, is rated at 2,000 A with a short-circuit rating of 23,100 A and an interruption time of 0·06 sec. Air pressure to operate this breaker, we were told, was 290 lb/sq in. The surge diverter, also full size, is designed to flashover at 710 kV ±7%.

How this equipment fits into the system is demonstrated by a map of the USSR network, illuminated to show

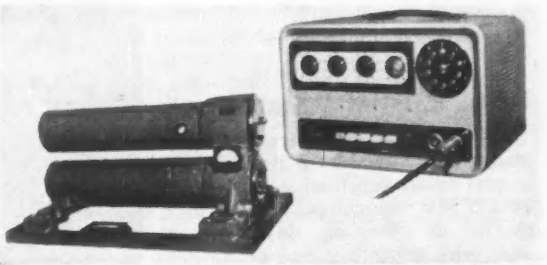
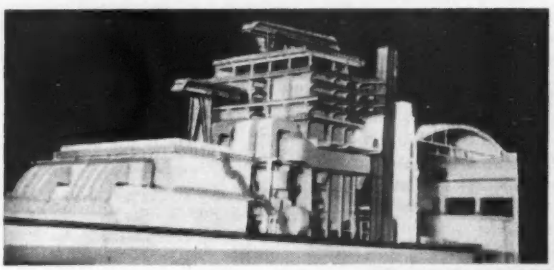


Fig. 1. Left, beta radiation gauge measures fabric weight without contact. Right, radiation counter, for sorting isotopes, which is in current production in the USSR

operating and proposed lines, and by a model of a sub-station for the Moscow-Kuibyshev line, whose prime object is to show the extensive use of reinforced precast sections for its construction. A model of a transformer, similar to units operating on both the Moscow-Kuibyshev and Moscow-Stalingrad systems, has a rating of 132 MVA single-phase with main windings for 525/13·8 kV.

Thermal generation, we were told by the guide, is the right thing for the USSR and 80% of the plant programme is for thermal stations. Large-scale models show the design of several thermal plants under construction and also of hydro-electric stations. An efficiency of no less than 40·4% is claimed for a design of a large thermal power station with an output of 2,400 MW. Two of these are under construction in central USSR and a third in Siberia. The station layout adopted is unusual for, to keep circulating water culvert length to a minimum, the turbo-alternator bay is erected alongside the cooling lake (Fig.2), and the 10 kV alternator output connections are taken over the top of the turbine and boiler houses and



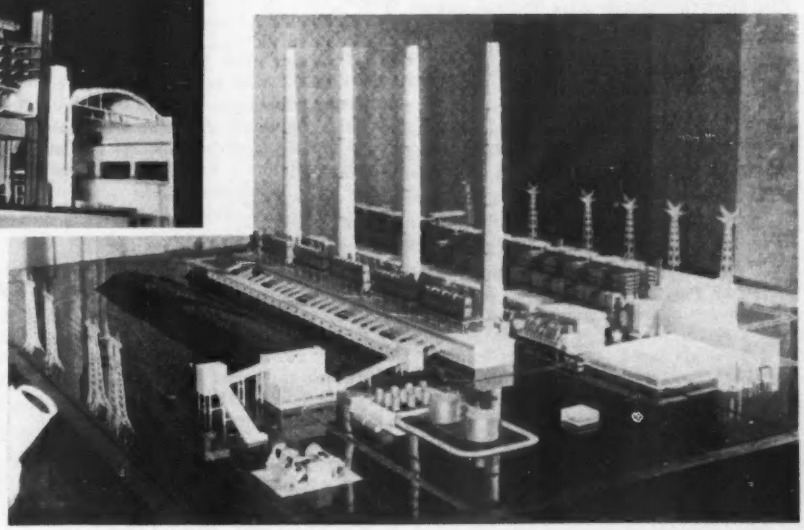


Fig. 2. 2,400 MW thermal station model with 10 kV o/h lines from alternator to switchyard passing above station, suspended from the chimneys. From right to left: cooling lake, turbine house, open type boilers, precipitators, coal-crushing and heating plant, coal store. The switchyard is not shown. Above, boiler close-up

the coal store to the substation for transformation to 500 kV. These overhead lines from the alternator to the substation are suspended from the power station chimneys. This type of station is to have 300 MW sets and we were told that an experimental set with this rating has been built. A cutaway, working model of the set construction is on display and also of the associated unit boiler with steam conditions of 2,140 klb/hr, 1,100 lb/sq in., 585°C with reheat to 570°C.

Another model illustrates the design adopted for a 400 MW station with four 50 MW and two 100 MW units. The station has eight boilers intended for firing with p.f., oil, or oil-residue gas (mazout). The model shown is intended to operate with a district heating scheme and it also has forced draught cooling towers for the circulating water.

Bratsk 4,500 MW Station

Hydro-electric generation is also well represented by models. A model of the Bratsk station in Siberia, which is now under construction, shows the disposition of the 20 225 MW alternators. Four of these units are expected to be in operation this year. The station has a dam over 400 ft high and nearly 5,000 ft long. A model of the Sarasov hydro station was stated by the guide to be typical of those on the River Volga. It has a designed rating of 1,400 MW, and extensive use is made of prefabricated reinforced concrete sections in its construction. Intended to operate with a head of only 46 ft, the turbines are unusual in that water flows over the dam crest, entering the turbine runner casing immediately. From the turbine exit, the water falls down a vertical suction pipe to the base of the dam. This construction is said to give certain advantages, since the turbines are mounted at dam crest level.

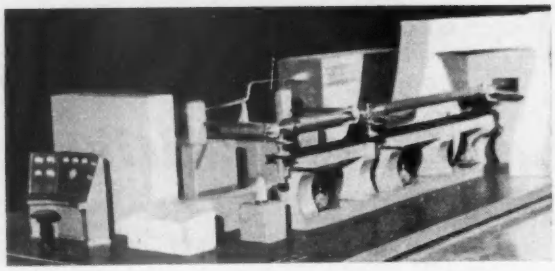


Fig. 3. Scale model of 60 MeV linear accelerator used for surgery and food sterilisation

Four English-speaking guides are in attendance in the power engineering section, and our guess is that they will have their hands full in dealing with the visitors' questions.

In the atom hall, models also illustrate nuclear stations under construction or planned. Shown are water-moderated, water-cooled and graphite-water reactors. Here, also, are models of impulse ionisation chambers and a model of a large magnetic trap for thermonuclear research.

Many of the exhibits in the industrial halls also show examples of electrical equipment. Spark machining and the electric alloying of metals are shown and, in the machine tools hall, there is a lathe with programme control and a selection of welding equipment. In the metallurgy section, displays include a model of an electric steel melting shop with continuous pouring facilities, and a working stand of an automatic steel rolling mill. Many other exhibits show the influence of electricity in the mining and chemical industries, but a particular attraction is the display of radio and television sets, including colour TV, and a selection of record players and tape recorders.

Materials for Electrical Design

GALLIUM ARSENIDE

SAMPLE quantities of gallium arsenide, a material promising for semi-conductor applications, are now available from Johnson, Matthey. The firm hopes that single crystal material will be available shortly. Typical properties of gallium arsenide are as follows: resistivity, 0·01 to 0·2 ohm-cm; Hall coefficient, 50 to 250 $cm^3/°C$; electron mobility, 2,000 to 4,000 cm^2/Vs; carrier concentration, 1 to 30 by 10^{16}/cu cm. The material is available either as broken ingot or cut slices. *Johnson, Matthey and Co, 78 Hatton Gdn, E.C.1.*

ANTI-CORROSION TAPE

DEVELOPED to combat corrosion of pipework due to soil chemicals or bacteria. Polythene Pipe Wrap is said to fill any surface voids when it is wrapped on to a clean pipe, so giving a continuous bond. The tape is formed from 10 thou. thick black polythene and has an adhesive film bonded by a key-coat. The tape is said to form a moisture resisting film and to have high electrical resistance. Suitable for a wide temperature range, it is also claimed to be unaffected by weathering and to be applicable under water. *P. P. Payne and Sons Ltd., Haydn Rd, Nottingham.*

LESS WATER ABSORPTION

INTRODUCED by Midland Silicones is a new silicone resin, DP2728, intended for use as an impregnant for cement-bonded asbestos board. Its purpose is to cut down moisture absorption. It is claimed that board impregnated with DP2728 will keep good electrical insulating properties even in conditions of 100% humidity. Applications of the board include insulating spacers and arc chutes. Preliminary data is given in the company's publication c 33. *Midland Silicones Ltd, 66 Knightsbridge, S.W.1.*

ADHESIVE COATED COPPER

ADHESIVE coated copper manufactured by the St Regis Paper Co of USA is being distributed in the UK by Omni (London) Ltd. Four grades are available, two each in 0·0014 in. and 0·0018 in. thickness; 1 oz and 2 oz/sq ft respectively. The copper is intended for use in making laminates, either of paper/phenolic or epoxy/paper/glass types. Samples and data sheets are available from the distributors. *Omni (London), 35 Dover St, W.1.*

ASBESTOS INFORMATION

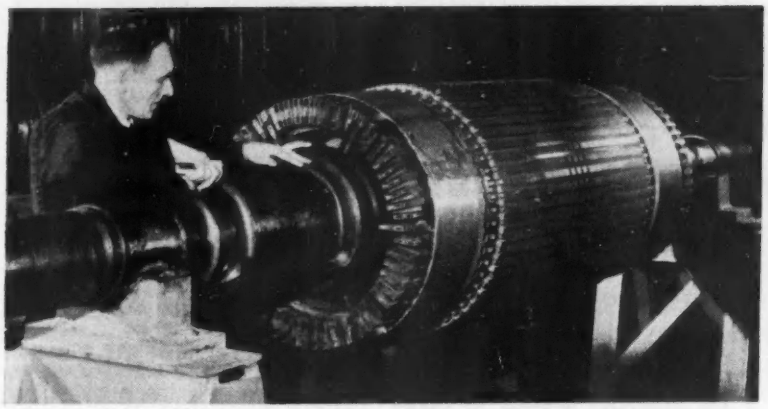
TWO booklets issued recently give information on material supplied by Turner Brothers Asbestos Co. One deals with Durestos, a moulding material manufactured from blends of asbestos and thermosetting resins. It describes the use of the material for various moulding techniques and lists extensive technical data. That booklet has reference number SA 6; the other, D 6, deals with Duraglas glass fibre reinforcements, and describes their applications at some length as well as giving price and technical information. *Turner Brothers Asbestos Co Ltd, Rochdale.*

PIPE THERMAL INSULATION

A FIBREGLASS insulating tape under the name PH Pipewrap has been introduced in rolls 3 in. wide by 12 ft long by 1 in. thick. The material is flexible and can be bandaged on steam and hot water pipes. The K value of 0·26 is claimed, and the material is suitable for temperatures up to 450°C. White p.v.c. bandage is available to provide a washable surface over the insulation. *Thermal Products Ltd., Browgate, Baildon, Yorks.*

Hollow Conductors for Feed Pump Drive

HOLLOW conductors are being used by English Electric Co. for high power and variable speed high power electric motors for driving large boiler feed pumps. Slip-ring motors are used for 3,000 r.p.m. running at outputs of 2,000 h.p. and more. Cooling the rotor end windings and at the same time giving adequate support is a problem being solved by the use of hollow rectangular section copper for the conductors, which are direct air cooled throughout their length. The air enters at each end of the rotor. Direct air cooling permits removal of the required heat with less air volume, so increasing the efficiency of the machine.



Slip-ring lead being fitted to 2,560 h.p., 3,000 r.p.m. direct-cooled rotor for Belvedere feed pump drive

Eight machines using rotors of this type are being commissioned for the main boiler feed pump drives at two CEGB stations. Four are for Willington B, rated at 6,200 h.p., and the other four for Belvedere, where the rating is 2,560 h.p.

Although the motors have been developed for boiler feed pump applications, they are available for other high speed industrial drives where speed variation and low starting current are advantageous.

Lighting and Heating Studies

ACTIVITIES of the DSIR Building Research Station during 1960 included many investigations of importance to the electrical industry. This is made clear in the recently published annual report,* with lighting and heating particularly prominent amongst subjects discussed.

The work on lighting generally forms part of the Station's investigation of the efficiency of buildings. One of the many developments has been extension of the Station's work on permanent supplementary artificial lighting of interiors (PSALI) to actual buildings.

The report comments that in technical colleges and schools which are much used in the evening, the economic advantages of fluorescent lighting have created a demand for a fitting to meet Ministry of Education requirements in respect of quality of lighting "at a reasonable cost and efficiency." Clip-on louvres designed by the Ministry of Works have come close to fulfilling these requirements, and a redesign has been undertaken by the two Ministries to match MoE requirements more closely. This new design has been tested at the Station and found "very satisfactory."

Hospital lighting receives separate discussion in the report. A stage has been reached when the results of recent research are being applied in building design. Various schemes are under discussion, and in one plan it appears that sufficient daylight without glare can be provided at a bed as far as 20 ft from the outer wall, but for deeper wards PSALI is likely to be required. Further study is thought necessary of acceptability of this technique with regard to visual comfort, colour rendering and colour compatability with daylight.

Lighting and heating in factories is the subject of a survey being made by the Station with reference to both initial and running costs. Supporting this survey has been preparation of specific designs chosen to contrast alternative design solutions and give some guidance to the relationship between costs and design.

The Station's continuing work on heating and ventilation has included particular attention to design problems involving varying heat input such as occurs with off-peak heating. The present report comments that the difficulties encountered in predicting the response of a building to given applied conditions lie less in the basic physics than in the mathematics involved. A major research aim is provision of simpler methods of calculation than are at present available, while retaining reasonable accuracy. Electrical analogues are being used to study this question. The analogues have also been applied to study the effect of structural design for daytime fall of temperature with off-peak floor-heating, and to find optimum heating cycles with intermittent heating.

A development in design methods for buildings has arisen from the Station's increased effort in hospitals, which are the subject of an expanded building programme at present. It involves a three-dimensional model technique, which is claimed to save time and achieve better design because constructive criticism is possible at an earlier stage. It is suggested that tender prices for pipe and other installation work can be lower when models are available at the tender stage because study of the model makes the whole process of estimating simpler. In the extreme, models may be used in substitution for drawings; this has occurred in some chemical works installation projects.

The social survey work which has for long been a feature of the Station programme has involved analysis of a small set of dwellings for old people in Edinburgh. This has shown that the tenants concerned were not markedly aware of "inconvenience in positioning of socket-outlets, switches, meters and so on." A larger survey covering many parts of England is now in hand. The Station is also giving attention to a Ministry of Housing request for advice on lighting that should be provided in accommodation for old people. This advice is being prepared jointly with the Medical Research Council.

* "Building Research, 1960." Published by HMSO, price 7s.

new products and appliances

Transistorised power units

TWO new transistorised power supply units are said to be particularly suited for research and development work on equipment employing semiconductor devices. Similar in construction, one unit gives a maximum d.c. output of 10 A at from 0 to 50 V, the other a 6 A maximum at from 0 to 80 V. Good voltage stability, allowing a ±15% variation of mains input, is ensured by a "Voltstat" constant voltage transformer and overload protection is afforded by an electronic trip circuit. For monitoring voltage and current, the equipment incorporates a two-range voltmeter and a four-range ammeter. Both instruments are overload protected, the current range selection switch automatically adjusting the overload trip circuit to operate at 150% f.s.d. Heat dissipation of the power unit is assisted by an internal air blower. *Advance Components Ltd., Roebuck Rd, Hainault, Ilford, Essex.*

Portable water softener

A PORTABLE unit for producing demineralised water for laboratory and industrial applications, the "Mk 7 Deminrolit" incorporates a renewable plastics cartridge containing anion and cation exchange material. Water passing through the cartridge is stripped of solids by ionising action and emerges with a purity said to satisfy the BP specification for pure water. At least 16 gallons of water of average mineral content can be purified by a single cartridge, it is claimed. The main body of the unit is also of plastics and features a built-in battery-operated tester to monitor continuously quality of water entering and leaving the equipment. *The Permutit Co. Ltd., Permutit Hse, Gunnersbury Ave, W.4.*

EE cut refrigerator prices

RETAIL price reductions have been announced by English Electric for "Slimline" refrigerators, models 7105, 7106 and 7107. Effective since 1 July, the new prices are, respectively, 72 gn, 89 gn and 106 gn, adjusted from £84 9s, £109 and £125. *The English Electric Co. Ltd., English Electric Hse, Strand, W.C.2.*

Efficient wire-stripping tool

FOR production stripping of lighter gauge equipment wires, a recently introduced automatic hand-tool has specially designed jaws said to eliminate fraying of insulation and conductor crushing or nicking. The jaws are easily renewable and the tool, which weighs 14 oz, will strip wires cleanly up to a length of ¼ in. For particularly high-quality work, such as required for aircraft wiring, a de-luxe version of the tool is available which is said not to scrape the wire or mark insulation. *Hellermann Ltd./Bowthorpe Electric Co. Ltd., Crawley, Sussex.*

Fittings to decorate the home

A SERIES of decorative lighting fittings in a variety of shapes, sizes and colours are among the new season's designs for domestic use. Contemporary styles and less ebullient designs are among this collection from Knightshades. Pendants in wrought iron provide an old world flavour, and they are available with between three and seven lamps. Counterparts for these are provided by matching wall-mounted fittings. Among the more modern designs are three floor standards with conical and cylindrical diffusers. Desk lamps and wall-mounted bedhead fittings are also in the range. *Knightshades Ltd., Silverhill Wks, Theaklen Drive, St. Leonards.*

W. German transistors

TWO new types of germanium p.n.p. mesa transistor manufactured by Siemens and Halske, Munich, have been announced. Designated "AFY 10" and "11 AFY," both types have case connected collectors and are said to be suitable for high-frequency oscillators, transmitters and low-noise amplifiers. *R. H. Cole (Overseas) Ltd., 2 Caxton St, S.W.1.*

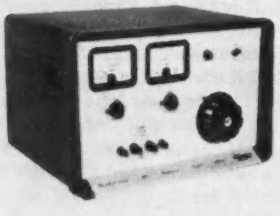
Kettle has modern styling

IN keeping with contemporary kitchen styling is a three-pint capacity kettle from Sona. Its 2 kW element is said to be fast boiling and incorporates the accepted safety device of an automatic plug ejector should the kettle boil dry. The plastics handle has a reeded grip and body construction is of nickel-plated copper finished in mirror chrome. Suitable for a.c. voltages, this kettle retails at £4 19s 6d including purchase tax. *Distributors: Falk, Stadelmann and Co. Ltd., 91 Farringdon Rd, E.C.1.*

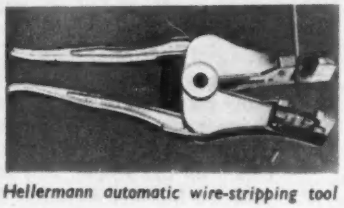
A.C. crane controller

SUPPLEMENTING an existing range, new a.c. crane control equipment has been announced, suitable for two-, three- or four-motion cranes, powered by squirrel-cage or slip-ring motors. The equipment comprises a drum controller, protective panel and resistance cubicle, and is available for up to 550 V working. Two sizes cater for crane ratings of 50 A and 100 A. Of compact dimensions, the drum controller features individual arc-shields for each contact and has a weather-proof housing of sheet steel. The operating handle incorporates spring-loaded return to the "off" position. The protective panel is fitted with a "DUPAR H" triple-pole main contactor. *Dewhurst and Partner Ltd., Inverness Wks, Hounslow, Middx.*

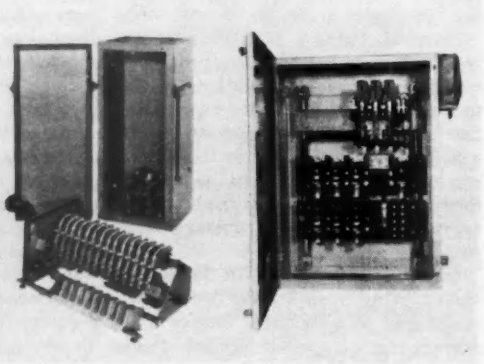
"Deminrolit" portable ion-exchange water softener features built-in purity monitor



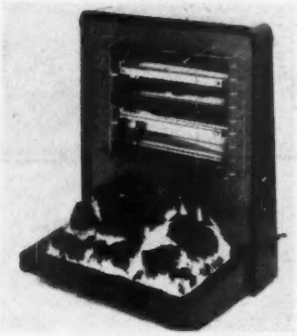
◀ *Transistorised laboratory power supply unit by Advance Components Ltd.*



Hellermann automatic wire-stripping tool



Drum controller and protective panel comprising a.c. crane control equipment by Dewhurst and Partner. "DUPAR H" triple-pole contactor mounted top right on protective panel



"Revo Regis" 2 kW coal-effect electric fire

New fire combines style with safety

ATTRACTIVE styling plus safety at a reasonable cost are selling features recommended for the new "Revo Regis" coal-effect electric fire. Retailing at £9 5s, it is available in two-tone colour combinations and has two separately switched 1 kW pencil elements suitable for 200 V to 250 V. Coal is simulated by a glass-fibre moulding which is washable and easily removable for access to the lamp flicker device. BEAB approved, all parts of the appliance, including the top-hinged fireguard, are positively earthed. To avoid mechanical damage to the element switches, dollies are recessed. The fire, which is of heavy gauge sheet, has a flush back with mounting holes drilled in the base, thus qualifying as a "permanent fitting" under the Clean Air Act. *Revo Electric Ltd., Britannia Wks, Tividale, Tipton, Staffs.*

Economy-priced electric blankets

INITIAL cost-saving is feature of two new electric blankets introduced for next autumn. Supplementing the "Standard" and "De-luxe" models in the Philips range, a third and cheaper "Family" blanket has been announced. Available in two sizes, it comes in amber-coloured cotton-rayon material finished with a two-inch edging of satin binding ribbon. An innovation is provision of tapes for securing blanket to mattress to prevent rucking. Sizes are 50 in. by 42 in. and 50 in. by 26 in., selling at £4 14s 6d and £3 13s 6d, respectively. Like the other Philips' blankets, the new model complies with BS and is eligible for the special blanket-cleaning service run by the company.

The "New Popular" budget-price electric blanket by Morphy-Richards replaces existing models and retails at £3 19s 6d for the single—and £5 12s 6d for the double—version. Blanket material is fleecy, wool-cotton-fibro mixture which is flame-proofed and available in pink with matching binding ribbon. This blanket, too, features mattress securing tapes and carries the BS kite-mark. Each version is supplied with a 9 ft flex lead and is fitted with a safety cut-out.

Philips Electrical Ltd., Century Hse, Shaftesbury Ave, W.C.2.

Morphy-Richards (Cray) Ltd., 50 Conduit St, W.1.

TRADE PUBLICATIONS

ALUMINIUM DEVELOPMENT ASSOCIATION.—*Directory of Members with Index of Products*, a publication for users of aluminium, listing castings, sections, foil, etc., with cross-reference to manufacturers. The Aluminium Development Association, 33 Grosvenor St, W.1.

CROMPTON PARKINSON.—Leaflet covering "A.R." range of salient-pole, flywheel type synchronous motors suitable for wide range of compressor designs to BS 2613. Gives constructional details of motor, illustrated by sectional diagrams. Crompton Parkinson Ltd., Crompton Hse, Aldwych, W.C.2.

ELCONTROL.—Illustrated data sheet describing "PS12" photoelectric lighting controller. Elcontrol Ltd., Wilbury Way, Hitchin, Herts.

FALK, STADELMANN.—Catalogue and price list for "Easiclene" and other domestic appliances. Falk, Stadelmann and Co. Ltd., 91 Farringdon Rd, E.C.1.

LUXRAM ELECTRIC.—Catalogue and revised price list for tungsten and fluorescent lamps. Luxram Electric Ltd., 72 Gt. Eastern St, E.C.2.

NEGRETTI AND ZAMBRA.—Up-to-date version of publication S109, detailing sales and service organisations overseas. Negretti and Zambra Ltd., 122 Regent St, W.1.

LARGE HEAT-TREATMENT FURNACES

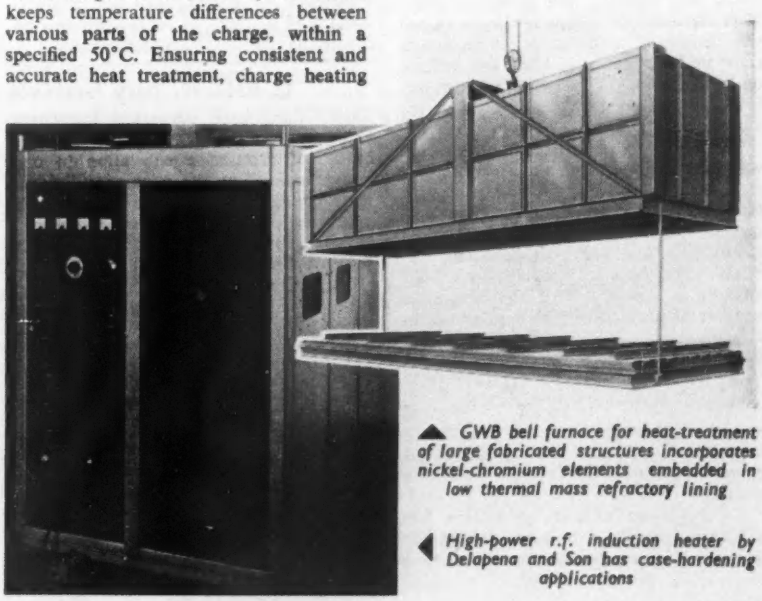
IN industrial heat-treatment, the merits of cleanliness and precise control offered by electric furnaces recommend their use for even the largest components or fabricated structures. Providing an economic solution to stress relieving of heavy welded structures, GWB Furnaces Ltd., in conjunction with the SSEB, have developed a lightweight bell furnace. The unit, which is also suitable for annealing and normalising, will accommodate in one piece large fabricated assemblies, such as cast-iron bedplates, pressure vessels and boiler shells. The main frame of the furnace carrying the mild steel casing is of rolled-steel section and incorporates a lifting eye. Coiled nickel-chromium heating elements are set in low thermal mass insulation lining the walls and roof of the bell chamber. To support the charge is a mild-steel structure topped with semi-refractory brickwork; grooves in the brickwork accommodate additional heating elements. Ensuring alignment of the bell during hoisting and lowering operations, guide posts are set at corners of the furnace base.

At the standard annealing temperature, in the range 600°C to 650°C, the furnace keeps temperature differences between various parts of the charge, within a specified 50°C. Ensuring consistent and accurate heat treatment, charge heating and cooling cycles are governed by a programme controller and temperatures recorded automatically by ancillary equipment.

In the r.f. induction heater field, Delapena and Son have extended their range of high-power equipment with the introduction of three new models. Two of these have continuous nominal outputs of 75 kW and 100 kW, while the third has a continuous rating of 75 kW but with the option of a 100 kW intermittent rating for three-minute periods. Applications of the equipment include case-hardening large shafts and internal bores of cylinder liners. High efficiency of operation is maintained for a wide variety of workpieces by use of alternative high- or low-impedance output terminals in conjunction with an r.f. matching transformer. Precise heating control is afforded by an external regulating transformer with provision for additional kVA boost by means of a push-button operated contactor.

GWB Furnaces Ltd., Dibdale Wks, Dudley, Worcs.

Delapena and Son Ltd., Tewkesbury Rd, Cheltenham, Glos.



▲ *GWB bell furnace for heat-treatment of large fabricated structures incorporates nickel-chromium elements embedded in low thermal mass refractory lining*

◀ *High-power r.f. induction heater by Delapena and Son has case-hardening applications*

News of the Week

Foreigners Can Join Research Associations

Consent of D.S.I.R. among conditions

A NEW policy about admission of foreign firms to membership of co-operative research associations is announced by DSIR in *Research for Industry 1960*, the annual report of the DSIR Industrial Grants Committee. In the past, foreign firms with no connection with the UK have been excluded from membership. Research associations have been invited to submit schemes for the admission of foreign firms subject to certain conditions.

Conditions under which foreign firms (i.e., non-Commonwealth) can be admitted include consent of DSIR, that they should have no voice in the government of the research association concerned, and freedom for British members of the association to oppose admission of a foreign firm on commercial grounds.

The report also notes DSIR negotiations with Commonwealth countries with the aim of securing contributions from Commonwealth governments when firms operating in those countries are members of research associations.

The research council of DSIR has been much concerned with accelerating application of research in industry, and it offers grants of up to two-thirds of the estimated cost of projects with this aim established by research associations.

All in all, DSIR grant to research associates reached £1·8 million in 1960 out of a total income from all sources of £7.9 million. Total number of grant-aided research organisations was 52 by the end of the year.

Much of the report is taken up with a brief guide to the work of grant-aided associations, a directory of their laboratories and officers, and a list of their 1960 publications. There are more extensive reviews of associations whose grants came up for renewal in 1960, and articles on contribution of research associations to health and safety, and on food research in the UK.

Examples of the sometimes unexpected way in which the work of research associations, with no apparent connection with the electrical industry in fact, affected it, occur many times in the report. One example is the work of the Commonwealth Mycological Institute on mould damage in industry. This has covered a number of problems involving damage to components ranging from instruments to cables and the growth of fungi in water-filled cooling circuits. Again, the British Glass Industry Research Association has been much concerned with electrical methods of glass making. Heat balances carried out in a glass-melting furnace with and without the operation of electric heating by conduction through the molten glass have established that whereas 20% of the heat in gas flames is applied usefully, 40% of the electrical energy is used directly—of course 100% is converted to heat in the glass, but 60% is subsequently dissipated as additional heat loss.

Wage Claim Coming?

A PAY claim on behalf of manual workers in the electricity supply industry is expected to be submitted by the union representatives within the next few weeks.

Although no official notification has yet been given it is understood that the union chiefs have been discussing matters recently in the preparation of a claim.

HIGHER S.A. DUTY

INCREASES in import duty on certain electrical goods imported into South Africa is being sought by local manufacturers as a means of gaining further protection for their industry. It is suggested that the duty on immersion heater thermostats for domestic hot water cylinders be raised from 15% to 33% *ad valorem*, and on electric hand lanterns from 15% to 25%. The SA Board of Trade and Industries is considering the applications, and is open to representations on the matter from UK organisations.

A.E.I.-Facit Link

ASSOCIATED Electrical Industries Ltd. have made an agreement with Facit Electronics AB of Sweden, as a result of which the AEI Electronic Apparatus Division has been appointed sole agents in the UK and British Commonwealth (except Canada) for Facit Carousel memory, high speed punch and high speed reader. Facit's Carousel is a new type of random access magnetic tape memory. When full it contains more than 3 million checked alpha/numerical characters or more than 5 million checked decimal digits. Average access time for a block of information is about two seconds.

Immersion Heater Tests

IMMERSION heaters are next on the test list of the British Electrical Approvals Board for Domestic Appliances. BEAB has announced its readiness to receive applications for test and approval. All applications received by 28 July will, if successful, qualify for inclusion in a list of approved models to be issued on 20 Oct. next.

A large proportion of immersion heaters already on the market are listed in the EDA list of approved appliances, and these will be accepted by BEAB in principle as complying with requirements.

A new BS for immersion heaters in the BS 3456 series is expected from BSI early next year; meanwhile, BEAB will test to the old BS 1556.

Further information of the approvals arrangements, which are open to foreign manufacturers as well as British, may be obtained from the director, BEAB, 27 Cockspur St, S.W.1.

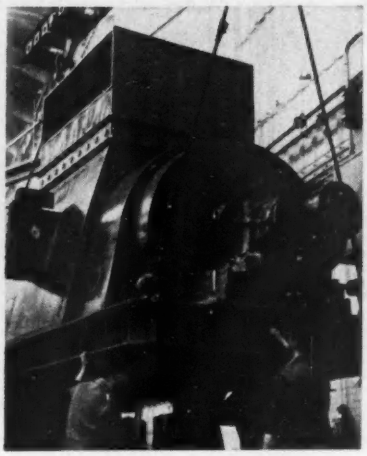
C.E.G.B. buy Sussex estate for Substation

THE CEGB have purchased Twineham Grange estate, near Bolney, with the object of erecting a substation in one corner and selling the remainder. Subject to planning approval, this brings to an end the search for a mid-Sussex site from which to reinforce the county's supply from the nuclear station being built at Dungeness. The Board had already been in touch with the county planning officers of both East and West Sussex in their quest for a site, with Shermanbury among the possible localities, but on discovering that Twineham Grange was coming up for auction, had to go ahead without waiting for formal planning approval. This is now being applied for from East Sussex CC and Cuckfield RDC. The whole of the estate was purchased to protect other potential buyers' interests.

The Board intend to build the substation in the north west corner of the estate. The site is midway between the two existing 132 kV lines running a mile or so apart from Three Bridges down to Brighton, and will, therefore, afford easy connections. It is well screened by trees and by the lie of the land.

Negotiations have also reached an advanced stage for the 400 kV line needed to carry power to the substation. Two alternative proposals have been placed before district councils in East Sussex; one the direct route originally suggested by the CEGB and the other a route favoured by the East Sussex CC after preliminary investigations.

Both routes enter East Sussex north of Rye, but from there the CEGB line passes north of Battle, whereas the County Council line passes south of Battle to rejoin the Board's route just south of Horam. From there the County Council line runs north west to the north of Burgess Hill, while the CEGB route runs west below Burgess Hill.



Claimed to be the most powerful direct-on-line starter motor in the world to operate an oil refinery process plant, this 13,000 h.p., 11 kV, 1,483 r.p.m. squirrel-cage induction machine has just been dispatched from AEI's Trafford Park Works. It is part of a £250,000 contract for the Esso Co.'s Fawley Refinery

New Factory Plans

Approved . . .

A 4½-acre site has been acquired by L. G. Hawkins and Co. Ltd. at Ponswood industrial estate, Hastings, on which a new factory is shortly to be built. It is hoped to occupy the building about the middle of next year, we understand.

. . . Rejected

AN appeal by Power Cables Ltd., against the refusal of Surbiton Council to permit the erection of a factory with offices and car park on land fronting Roebuck Rd, Chessington, has been dismissed by the Minister of Housing and Local Govt.

Pye links with U.S. vibration firm

IN exchange for commercial goodwill, Pye are acquiring American know-how in the field of vibration testing equipment. They are forming a partnership with Ling Temco Electronics Inc., of Dallas, Texas, which will manufacture in this country both the Pye and Ling ranges of vibration-fatigue testing systems. Because of the millions spent in the US on rockets and space research, Ling have developed very advanced techniques. It is not expected that Ling will manufacture Pye products, but there will be a two-way exchange of know-how which it is claimed will give the Pye-Ling partnership a capability unmatched by any other organisation, in the West in this field.

Pye have been making vibration equipment for six years, through their subsidiary, W. Bryan Savage. The vibration division of Savage will now be hived off to a new jointly owned company to be known as Pye-Ling Ltd. The turbine makers have been among Pye's customers.

HALIFAX'S £34,500 APPEAL ALLOWED

THE Court of Appeal has allowed Halifax Corporation's appeal against a High Court decision that the Corporation must repay £34,500 to the CEGB. But the Board have been granted leave to take the matter to the House of Lords.

The appeal was against the High Court decision of May, 1960, when it was adjudged that the sum should be handed over to the CEGB.

But that order has been set aside.

The Appeal Court has held that the Board's claim was statute-barred because the writ was not served within six years from 1948, when the cause of the action arose.

In a reserved judgment, Lord Justice Ormerod said the £34,500 was transferred to the Corporation's general rate fund suspense account immediately prior to nationalisation of the electricity supply undertaking in April, 1948. It was a routine matter of book-keeping by the borough treasurer and was not a policy decision.

The Board, however, contended that the sum was part of the assets of the Corporation's former Electricity Dept., and should have been transferred to the Board on nationalisation. In the action last year, the trial judge upheld the Board's contention that the course of the action did not arise until 1958, when the Minister of Housing and Local Government decided that the money was held by the corporation as undertakers, and the writ had been served, therefore, well within time. Lord Justice Ormerod's view, from the wording of the Electricity Act, was that the cause of action arose at the date of nationalisation, April, 1948, and the time in which to serve the writ expired in 1954.

Agreeing with that view, Lord Justice Devlin said he doubted if the Board could have succeeded even if they had sued within time, as the Act gave the Board no right to recover money. The action was misconceived.

Lord Justice Dankwerts also agreed that the Board's claim was statute-barred. At the High Court hearing last year, the CEGB submitted that the money was part of a fund accumulated and set aside by the electricity undertaking to meet income tax and excess profits tax, and should have been transferred on vesting date to the Board. Some time in 1947-48 the money in that account was transferred to the income tax suspense account of the general rate fund by a decision of the borough treasurer on his own authority and without any resolution authorising the transfer.

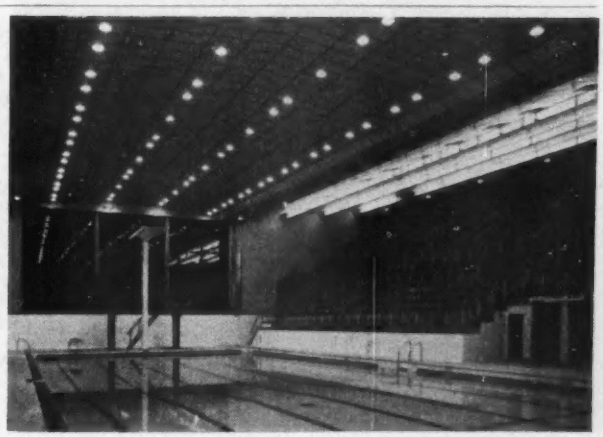
Station beautifying treatment

DURING the past 12 months the Roads Beautifying Association have spent more than half their time advising the CEGB on the planting of suitable trees, bushes and plants in and around power stations and substations. This is revealed in the Association's annual report, recently published. Since becoming associated with the electricity supply industry nine years ago, the Association have given special treatment to some 45 power stations, 40 substations and nine miscellaneous sites.

Physicists' amalgamation

LAST week saw the first a.g.m. of the amalgamated Institute of Physics and the Physical Society. At this meeting the "caretaker" council, which has been in office since the amalgamation in July of last year, was replaced with the first elected council of the amalgamated body, under the presidency of Sir John Cockcroft. It has much the same personnel as the interim council.

The annual report of the Council for the calendar year 1960 covers the activities of the Institute and the Society, as well as the combined body. By the end of the year, total membership in all grades was 8,720. The membership of the amalgamated body is stated to be growing rapidly, and difficulties about accommodation are increasing. Ways and means of meeting this situation are currently under consideration.



Walsall's new swimming baths use nearly 100 Holophane circular "Lentilite" prismatic glass fittings, each with a 300 W tungsten lamp, recessed in the ceiling. Main lighting of some 15/16 lumens/sq ft over the pool area is by four rows of "Lentilites". 8 ft fluorescent tubes illuminate the spectators' gallery. Electrical contractors were Birch, Evans and Jellings Ltd.

BOARDS SELL MORE WASHING MACHINES

THE principal changes in the pattern of area board appliance sales in May were a downturn in immersion heaters after a steady rise of several months' duration, better washing machine and clothes dryer sales, and some improvement in refrigerators. While seasonal demand for refrigerators has not come up to expectations, May's figures were not as bad as April's, when the shortfall was 32·3% compared with a year earlier.

Manufacturers seem to be having considerable success with new design washing machines. For the first time in months, sales by the area boards are above the level of a year ago, even if it is only by a fraction. Clothes dryers, too, turned the tide, in this case by a handsome margin. Washboilers, on the other hand, slipped in popularity.

Appliance sales by Area Boards	Sales in month ended 31 May, 1961		Sales in 12 months ended 31 May, 1961	
	Total	% change over corresponding period of 1960	Total	% change over previous 12 months
Cookers ...	28,505	+ 7·1	342,792	− 0·3
Water Heaters:				
Immersion...	22,396	−15·7	197,684	+ 2·1
Storage ...	5,245	−18·1	63,695	− 4·8
Washboilers	4,272	−10·8	54,483	−13·9
Washing Machines	8,245	+ 0·3	98,412	−35·3
Refrigerators	18,631	−17·2	133,521	−18·8
Clothes Dryers*	1,512	+31·8	52,690	not avail.

* 11 Boards only

Floodlighting of Greys Court, an Elizabethan house was accomplished during Henley Week by the use of a single quartz iodine filament lamp only 2½ in. long, operating at 500 W. The improvised lantern housing the lamp was mounted 150 ft away from the house

Miniature Lamp Floodlights Historic House

WHEN Son et Lumière was presented at Greys Court, near Henley-on-Thames, recently, there was more of interest to be seen than the much praised spectacle "This Tower My Prison," with its lighting effects provided by Atlas Lighting Ltd. under control of their Aurama tape-based system. Some "front of house" lighting before and after the main show took the form of floodlighting for the Elizabethen house opposite the ruins. The interest lies in accomplishment of this by a single 500 W quartz iodine lamp only 2½ in. long. The lamp, which operates without control gear of any kind, is one of a range being developed by Atlas for various purposes, including high-intensity photographic lamps in which it is in an advanced stage. It was mounted in an improvised lantern housing some 150 ft away from the house, although the lamp could be used at much closer range in a suitably designed fitting.

CRIMPING TOOL PATENT

AMP Incorporated have now filed an appeal to the House of Lords in their action against Hellermann Ltd., concerning the patent covering crimping tools for electrical connectors. We referred to the result of the latest action in our issue of 29 June, but it is regretted that by an unfortunate error the names of the two parties were then transposed. That action was, therefore, an application by AMP Incorporated to amend their patent specification, to which Hellermann Ltd. successfully objected.

It seems unlikely that the matter will be dealt with in the Lords before early next year.

E.R.A. WELCOMES VISITORS

COMBINED with the formal opening of the ERA creep of steel laboratories, which we reported last week, were the first open days at the Leatherhead laboratories of the Association since 1957. Visitors had the opportunity of seeing not only the new creep laboratories, but also the way work has expanded in the main laboratories and the h.v. laboratory. The new administration and office block that has taken the place of Thorncroft Manor was also on show.

The new office block is of additional interest for its use in experiments on off-peak floor-warming. The building structure is light, so that only the floor slab and the building contents have any appreciable thermal storage. Double glazing was incorporated and a directly embedded heating system decided on. A 2½ in. screed was laid for the upper floor and covered in the main in heavy linoleum. The screed on the ground floor was of the same thickness.

All rooms have air thermostats used as over-temperature safety devices only, the installation as a whole being operated by time-temperature control.

With a total floor area of 11,780 sq ft, the offices have an installed electrical heating load of 132 kW on the basis of 12-hr night supply with two-hr mid-day boost. Although block heaters were installed in case the limited thermal storage available led to high rates of cooling, these have not been needed.

Inspecting the new creep laboratory are Dr C. Sykes (Thos. Firth and John Brown), who opened the laboratory, ERA director Dr H. G. Taylor, Mr J. Knox (DSIR), and Mr L. Rotherham of the CEGB, who is chairman of the ERA Council

REFRIGERATOR SALES DOWN AGAIN

THE pessimistic view of refrigerator trade, expressed in some quarters when Hotpoint announced recently their decision to cut out night shift at Peterborough after the August recess, has been given weight by the latest figures of manufacturers' deliveries. Compared with a year earlier, when the credit squeeze was already in force, May deliveries were down 12% in the home market at a total of 120,535. Nor, in view of the fine weather, does this make a particularly good showing against the 103,019 delivered in April this year (which was 14% below April, 1960).

Moreover, exports are still declining, which manufacturers blame on the Government's restrictive policy at home, making economic production increasingly difficult. After falling by 17% in April, the first drop in months, deliveries overseas in May were 20% lower than a year ago.

AT THE ROYAL SHOW

DEVELOPMENT of pre-packaging with a number of manufacturers showing vegetable washing equipment along with the growth of automatic control on the farm were features of the 1961 Royal Show held at Cambridge last week. Latest example included the automated provender plant for alternative meal and pellet production complete with 'automation board' by Scottish Mechanical Light Industries and the "Belle City" mix mill unit which mixes and grinds up to four different ingredients in one operation, shown by Norstel and Templewood Hawksley Ltd. Left are seen Mr R. A. Bayetto, rural electrification officer, talking to Mr D. H. Kendon, Manweb chairman and Mr R. I. Bernard, E.D.A. director/sec.

Civil's Appeal for Research Funds

RESEARCH in civil engineering is the concern of a new Civil Engineering Research Council which has been set up by the Institution of Civil Engineers, Federation of Civil Engineering Contractors and the Association of Consulting Engineers, which was established in November last year. DSIR have recognised the Council, which is now appealing for funds to permit it to expand its work.

The Council does not intend to establish a special laboratory at present, but to use facilities provided by DSIR, co-operative research associations, the universities and industry. The Council aims to receive and consider proposals for subjects for research and select those with the strongest claim for immediate attention. It will then allocate funds to research establishments willing to undertake this work and provide co-ordination.

At present, 12 subjects are under consideration. Listed as follows they are estimated to involve an expenditure of about £250,000: behaviour of structures under service conditions; composite construction; fatigue of engineering structures; mining subsidence; piled foundations; durability of prestressed concrete in sea water; floods in the British Isles; hydraulics of sewerage and sewage disposal; design of arch dams; ultimate load design of concrete structures; accelerated testing of concrete; vibration of concrete.

Funds to the total of £20,000 per annum are already assured for the Research Council, but the Institution has now opened an appeal to secure an increased income.

Lower Quotes in U.S.

A PRICE war in heavy electrical equipment is developing in the US following the price fixing case, judging by a remark made last week by Mr Frederick Erroll, Minister of State BoT, on his return from a visit to the South-West, Middle-West and Canada's prairie provinces. Mr Erroll said he had been told on several occasions that some very low tenders were now being submitted by US firms. Nevertheless, there are still good opportunities.

Supply Salary Changes

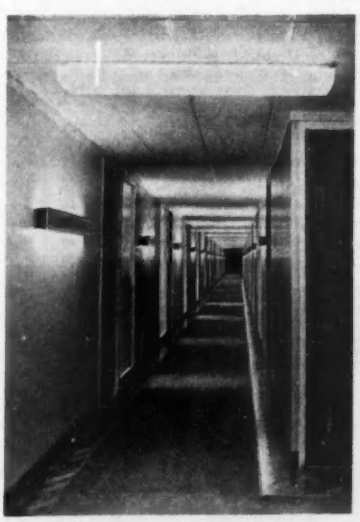
NEW adjustments in the basis of agreements involves certain changes in salaries in the Electrical Supply Industry. Under a devaluation of units, the points ranges of area board headquarters and sub-areas have been modified, back dated to 1 Jan. 1961 for Scottish Board, and 1 April, 1961 for boards in England and Wales.

Class B and above power station superintendents are to become Grade 6, and Class "A" superintendents in England and Wales get the equivalent of an extra half-grade an increase of £100 p.a.

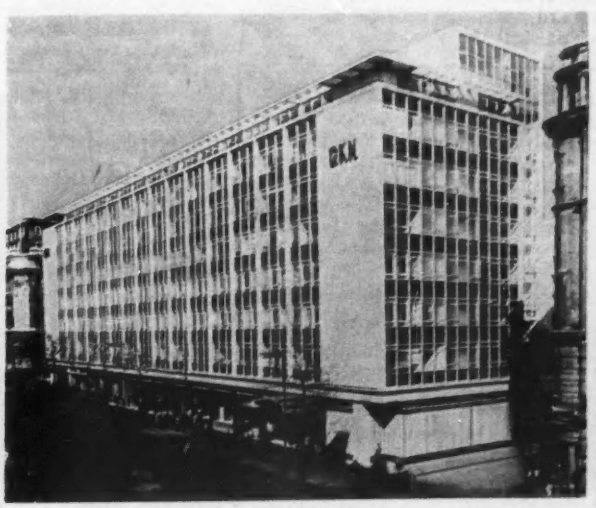
Testing Installations

FOLLOWING our report last week on the scheme for testing electrical installations and appliances which is being introduced by the South Western EB, the North Western EB have reminded us that they have operated and publicised a somewhat similar scheme for the past ten years. Unlike the SWEB, however, they make no charge. NWEB service centres publicise the scheme with a card reading "If you are moving to a previously-occupied house, or making improvements to your present house, we should be pleased to check your electrical installation without charge."

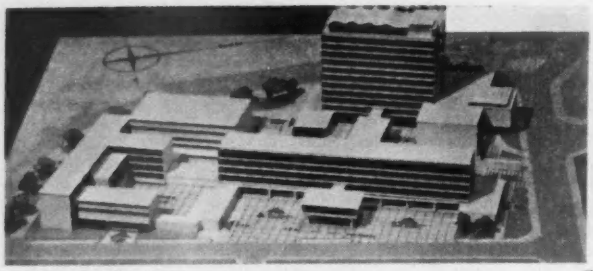
NEW LANDMARK IN KINGSWAY



Left, in the corridors, lighting fittings are fixed to metal partitioning. Right, general view of exterior of GKN House, looking north



GKN House, the new London headquarters of the Guest, Keen and Nettlefolds Ltd., group, in Kingsway, W.C.2., immediately adjacent to our own offices in Sardinia House, was officially opened last week. Built on the site of the old Stoll Theatre, it is a seven-storey building with 92,000 sq ft of office accommodation. Electrical work was carried out by Phoenix Electrical Ltd., who fitted A.E.I. special suspended fluorescent lighting in all office areas. In the corridors, G.E.C. fittings are attached to the metal partitioning. Ducts for electrical, G.P.O. and internal telephone runs are provided in the skirtings and, where necessary, in the floor slab. Illuminated ceiling in the foyer was provided by Ionlite Ltd., and in the showrooms by Courtney Pope. McLellan and Partners were consulting engineers (electrical)



Floor-warming has been chosen for the first sector of a proposed new Civic Centre at Huddersfield. Load will be 600 kW, but if accepted for the remainder, the total will be 3,000 kW — probably the largest installation in the country. As the model shows, the Centre will give a new look to Huddersfield

APPEAL IN E.T.U. CASE

AN appeal is pending against Mr Justice Winn's findings in the Electrical Trades Union "election rigging" case, the judgment of which we reported last week. It is understood that the appeal will apply both to the question of conspiracy and the judge's declaration that Mr J. T. Byrne is now general secretary of the union.

Mr F. Foulkes, president, last week said "If there was anything wrong, I knew nothing about it and I want all my members to know that. I have been caught up in a vortex."

In the House of Commons last week it was stated that the judgment given in the case was being studied very carefully by the Minister of Labour.

Another action against certain officials of the Union, due to start in the High Court last Tuesday was adjourned on an application by Mr F. Haxell and the Union, under which it was also agreed to lift the five-year suspension on Mr L. Cannon, the former principal of the Union's Esher training college.

Mr Cannon was suing Mr Haxell, the general secretary deposed by Mr Justice Winn's order, Mr E. S. Turner, an area secretary, and the ETU. Mr Cannon sought a declaration that a committee's decision that he be fined £5 and debarred from holding office for five years was null and "contrary to natural justice." On Friday it was stated that Mr Cannon was ready for the trial except that the defendants said they were unable to produce the vital document relating to the branch which had been accused by Mr Cannon of rigging its ballot.

In a subsequent action, Mr J. Chapple is alleging that the election of Mr R. McLennan, at present acting assistant general secretary, was "rigged," and in a third action, Mr T. R. R. Odlin is asking for the production of certain union accounts, claiming that some payments made by the union were invalid according to the rules.

Semiconductor Conference

AN international conference on the Physics of Semiconductors is to be held at the University of Exeter from 16 July to 20 July, 1962. Arranged by the Institute and Society on behalf of the International Union of Pure and Applied Physics, and the British National Committee for Physics, it will follow the previous sequences of conferences on the subject held in recent years—the last at Prague in 1960.

B.E.A.M.A. again to show at Cologne Fair

IN view of the successful exhibit of British domestic electrical appliances at the International Household Goods and Hardware Fair, Cologne, last February, plans are being prepared to exhibit at the Spring Fair next year. And following an approach by BEAMA, the Board of Trade has altered its financial support policy. The BoT is now offering continuing assistance to trade associations on the basis of (a) for the third and subsequent years, paying all the cost of stand construction provided that 20% or more of the space is occupied by firms which have not exhibited twice before, or (b) paying 55% of the stand construction costs where 80% or more of the space is taken by firms which have exhibited at least twice before.

BEAMA have already put forward specific proposals for 1962.

Switchgear Consolidation

FOR reasons of efficiency, Crompton Parkinson have decided to transfer the manufacture of Cooke and Ferguson switchgear from that subsidiary's Openshaw works at Manchester to the parent's Switchgear Division at Chelmsford. It has not yet been stated what will be done with the Openshaw works.

ELECTRICAL EXPORTS GAIN GROUND

THE lighter side of the electrical industry made the main contribution to an 8% rise in electrical exports from £127·9 million to £138 million in the first five months of 1960, BEAMA reports. Radio and telecommunications accounted for almost half of the increase, lifting exports by £4·9 million to £32·4 million, with radio communication and navigation aids accounting for £9 million of the total. Sales of domestic appliances advanced by over £2 million to £15 million for the five months, both washing machines and vacuum cleaners showing considerable increases. Electrical and allied machinery turned in a steady £37 million performance, but cables fell slightly to £10 million.

Commonwealth countries continued to be the chief customers, with sales to Australia, New Zealand and South Africa showing a substantial improvement on the first five months of 1960, though sales to Canada, as to the US, declined. More notable is a 50% jump in exports to the Six, while deliveries to EFTA partners rose by 13%.

Electrical imports into the UK are rising more slowly. The total of £28·9 million for January-May compares with £27·9 million previously, a rise of 4%. Radio and electronic equipment accounted for about 28% of imports.

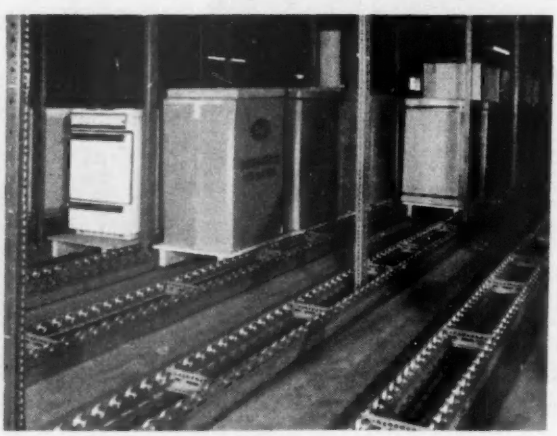
OFFICIAL PUBLICATIONS

Research for Industry, 1960. Report on Work Done by Industrial Research Associations. HMSO. 8s (see page 54).

BS amendments: 480, Impregnated Paper-insulated Cables for Electricity Supply. Part 1, Lead or Lead-alloy Sheathed Cables for Working Voltages up to and including 33 kV, PD 4172; Part 2, Aluminium Sheathed Cables for Working Voltages up to and including 22 kV, PD 4173; 816, Requirements for Electrical Appliances and Accessories, PD 4166; 3224, High-intensity Elevated Runway-lighting Fittings, PD 4174.

UK. AEA Report for 1960. H.M.S.O. 5s (see page 45).

Speedy Handling of Cookers



Speeding the flow of electric cookers from stocks to showroom is aided by 10,000 Dexion glidewheels at the Pardon Dene stores of the North Eastern Electricity Board. From a central gangway cookers are fed in, on wooden pallets, on to 42 lines of conveyors, each 23 ft long. Dexion also supports a 7 ft high storage area providing another 72 ft by 60 ft of space

Bridge uses commutator motors

VARIABLE a.c. commutator motors are claimed to be used for the first time in a bascule bridge control in a bridge at Kingston upon Hull which was formally opened last week.

Two 140 h.p. AEI motors raise and lower the 105 ft single-span bridge which weighs about 1,500 tons. The advantages offered by the motor are constant speed over the wide torque range to which varying wind pressure on the bridge subjects the motor. This type of motor also offers uniform acceleration and deceleration under load.

The motors go quickly to 100 r.p.m. and then accelerate to 1,000 r.p.m. in 15 sec. When the bridge reaches 70° from the horizontal the motors begin to decelerate, and they slow down to a point where mechanical brakes are applied within 15 sec. This control cycle permits the bridge to be raised or lowered in less than 2 min.

SATELLITES IN COMMUNICATION

EXPERIMENTS are promised next year with a satellite for communication purposes. This will be part of a widespread programme of work which could greatly improve communications between the UK and America.

In preparation for the tests, the Post Office is providing an experimental ground radio station on the Lizard, Cornwall. The proposed tests will cover the transmission of speech, telegraphy and television across the Atlantic.

Discussing prospects for communications satellites system, the GPO has listed four desirable targets:

(i) continuous 24-hour service should be available for telegraphy and telephony between all ground stations provided in connection with the system.
(ii) world-wide coverage should be provided in association with the existing cable and radio links.
(iii) provisions should be made for the satellites to carry about 1,000 telephone channels and one or two television links.
(iv) the system should be capable of carrying the traffic in the minimum number of hops and the bulk of the traffic in one, i.e., by bringing into use only one satellite for the operation.

Sayings OF THE WEEK

"So far as I am concerned this is a sad business for Notts. The site would have been the cheapest place in the Midlands for the project and it would have been built on the least valuable agricultural land." . . . ALD W. BAYLISS, chairman, Notts County Council, referring to Holme Pierrepont site rejection.

"British industry is no longer a captive market for British coal. The day has gone when increasing cost could be retrieved by adding to the price of coal." . . . LORD ROBENS, at the annual conference of the National Union of Mineworkers.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, July 11

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	230½	+2
,, (3 months)	235	+2
LEAD, refined pig, 99·97% purity (cash)	64½	−⅞
,, (3 months)	65½	−½
TIN, refined, min. 99·75% purity (settlement)	919	+7
(3 months)	929	+13
ALUMINIUM, ingots 99·99·5%	186	—
,, wire bars (4×4×54")	193½	—
BRASS Strip 63/37	198½	—
SILVER (Troy oz)	79½d	—
ZINC, virgin, min. 98% purity (cash)	77½	−⅞
,, (3 months)	78⅝	−⅞
RUBBER, per lb		
No. 1, RSS, spot	24⅞d	+⅛d
c.i.f. basis, ports, Sept.	24½d	—
ARMOURING:		
Galv. Steel Wire (0·104 in.)	67½	—
Mild Steel Tape (0·04 in.)	53*	—
NICKEL (home)	660	—
MERCURY (76 lb flask)	66	—
AMERICAN PRICES:		
Copper, electrolytic (per lb)	31c	—
Lead, (New York)	11c	—

* *Tape Price, now an average, includes varnishing*

LARGE CONTRACTS AWARDED

A £100,000 contract for reinforcement of the distribution system between substations at West Weybridge, Surrey, and Laleham, Middx, has been placed with AEI Ltd. by the South Eastern Electricity Board. The project will involve laying four miles of 33 kV oil-filled cable. They will be taken across the Thames in buried pipes. Two canal crossings are also involved.

A cabling order at Bankside power station, worth about £100,000 has been awarded to Malcolm and Allan (London).

Nife batteries have been ordered for supplying emergency services at the new Shell South Bank building. In the event of a total mains failure the 240 V 200-cell battery is rated to supply a load of 7·9 kW for three hours. A 24 V battery is being supplied for the security alarm system and a 50 V battery for the lift alarm system.

A 12,750 kW turbine and condensing plant for the National Gas Turbine Establishment, Pyestock, has been ordered from Belliss and Morcom Ltd. A straight condensing set, arranged to drive an existing alternator which has hitherto been driven by a gas turbine, it is to utilise the existing foundations.

A materials handling plant, valued at £125,000, with a maximum unloading capacity of 2,000 tons/hr, has been ordered from the General Electric Co. by William Hamilton and Co. Ltd., of Glasgow, for installation in a self-unloading ship which is to operate in Canadian waters. Coal, limestone and other bulk cargoes will be carried in four holds.

An order for the complete electrical and electronic equipment needed to drive and control a wallpaper producing machine has been awarded to the AEI Motor and Control Gear Division. The order, from Wall Paper Manufacturers, is for a nine-section electrical drive which includes two motor generator sets, one having four generators with a total output of 342 kW and the other having five generators totalling 306 kW.

INSTRUMENT TAKEOVER

HILGER AND WATTS have taken over Microwave Instruments, North Shields. The two companies have been collaborating in the development of measuring apparatus for electron spin resonance and their ranges of instruments are complementary.

Seeboard Commercial Staff Association

TO further the interests of all commercial staff of the South Eastern Electricity Board is the chief aim of a new organisation recently formed, the South Eastern Electricity Commercial Association. It is intended to develop a framework of district representatives to form a system of area committees with their officers serving on a central committee.

News in Brief

Ghana propose to levy 66⅔% purchase tax on domestic electrical equipment.

The British Electrical and Allied Industries' Research Association has sold its former home, Thorncroft Manor, Leatherhead, to St. Christopher's School, Great Missenden.

A record sum of over £779 for the EIBA was raised by this year's Midlands area competitions of the Electrical Industries National Golf Championships, played off at Edgbaston course.

The ETCTA contributed more than £800 of the total of £2,900 collected at the fete of the Royal Commercial Travellers' School, Hatch End.

Huddersfield Finance Committee have proposed the installation of an electric heating system on a section of Chapel Hill at a cost of £4,000.

Some 500 of the 800 employees at the Hillington works of L. Sterne and Co. have been warned that they will become redundant at the end of July.

Annual meeting between Electrical Industries Club Golfing Society and the Birmingham Electrical Club's Golfing Society took place on 28 June at Frilford Heath. The match was 16 aside and was won by Birmingham on the last green by the last four to return to the club house.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Meter Supplies

The quest for overseas tenders for the supply of 5,000 electricity meters by Calgary City Council, to which we referred on 15 June, has resulted in 39 manufacturers in seven foreign countries seeking details, we understand. Five of the agents represented Japanese firms, while other firms are in Britain, Switzerland, Italy, Holland, Belgium and the US. Bids are to be opened on 31 July.

More HE?

Further power plants on the Mississauga River are envisaged by the Hydro-Electric Power Commission of Ontario. Probably in about ten years' time it is expected that Gros Cap and Aubrey Falls, upstream from the George W. Rayner station, will be added to the productive capacity of the river. It is anticipated that together they could add 80 MW. It is admitted that there are complications in the upstream development plans, particularly the need to flood the present Chapleau highway.

Quebec's Expansion

With an average domestic consumption of 4,283 units last year—an increase of 4·82%, the Quebec Hydro-Electric Commission increased its electricity output by 13·5% to 14,600 million units during the year. More than 21,000 new consumers were connected to the system during the period, raising the total to 547,806 at the end of December. Total installed capacity also increased to 3,347 MW, with the addition of four more sets at Beauharnois, and the last two 121 MW machines at Bersimis II. A gas-turbine standby plant of 36 MW capacity at Les Boules was also commissioned. Initiated under emergency circumstances in 1960, in view of troubles with under-water cables, this station will supply emergency and peaking power to the major industries on the Gaspé Peninsula. As a further security measure and to increase available output, an overhead transmission line is being erected to connect Charlesbourg and the South Shore at Les Boules and at Chandler, where a paper mill is under construction. On new generating capacity, work is being concentrated on the Carillon hydro-electric project on the Ottawa River, where four 60 MW sets are expected to be in service next year. The plant is scheduled to have 14 such machines and, looking further ahead, it is already planned to build a dam on the Manicouagan River, some 150 miles north of the St. Lawrence River. A 130 mile-long power line, initially to operate at 161 kW, has been erected to the site, but ultimately it will form part of the 300 kV system.

BRITISH GUIANA

Work Begins

In the new power station project for Georgetown, British Guiana, civil engineering work has started on site. The aim is to have the first of two 10 MW steam turbo-generators in commission at the end of next year. The project is being undertaken by a consortium, AIT (British Guiana), formed by the AEI Export Co. together with International Combustion (Export) and Taylor Woodrow (Overseas). The latter concern is now working on the foundations of the power station which is to be supported on piles because of the swampy ground. AEI are supplying the generators and International Combustion the boilers.

PERU

HE Survey

Surveys conducted by Hunting Associates of Toronto, Canada, now show the hydro-electric capacity of the Mantaro River, Peru, as 3,700 MW instead of a previously estimated 1,100 MW. The Mantaro River hydro-electric project is one of the principal features of the Peru-Via development scheme.

GHANA

Volta Aid?

Financial aid from the USA has been promised to Ghana in the construction of the Volta River hydro-electric project, it has been reported. President Kennedy is said to have made the offer to President Nkrumah, but so far no reply has been received. But a similar offer is said to have been made by Russia.

INDONESIA

Plant for Cotton Factories

Orders worth £1 million for the supply of equipment for three new cotton factories, to be built in Indonesia, have been awarded to the Heavy Plant and Motor and Control Gear Divisions of Associated Electrical Industries Ltd. An order from Platt Bros. (Sales) Ltd., the main contractors, covers the supply of diesel generating equipment, lighting, switchgear, transformers, cabling, cranes and gantries, fuel-oil storage tanks and various diesel-engine auxiliaries. Other orders received from the manufacturers of mill machinery are for several hundred contactor control panels, contactor starters and small industrial drive motors rated from 1 h.p. to 5 h.p. Power for each factory will be supplied by four 1,070 kW 3·3 kV generators, each driven by a Mirrlees engine. An auxiliary Paxman/AEI diesel generating set rated 165 kW, 380 V will supply power for the factory lighting equipment and essential auxiliaries. The factories are to be sited in East, Central and West Java.

PAKISTAN

Railway Signal Order

Modern electric signalling is to be introduced on the Pakistan Western Railway and Pakistan Eastern Railway, and orders have been placed with Siemens, of Germany. The scheme is to cost Rs15 million. Some of the equipment will be manufactured locally at the Haripur telephone factory, which will be expanded for the purpose.

AUSTRALIA

Station Wanted

Pressure for the establishment of a steam power station in the Fingal Valley, Tasmania, as a means of saving the local coal mining industry, is being instigated by the local population. At a public meeting there a few days ago it was agreed to ask the State Government to appoint a select committee to investigate the claims for a thermal power station in Fingal Valley. The manager of the Cornwall Coal Co. said investigations by a sub-committee had found that thermal power could be produced there at 0·83d/unit, which compared with the average price received by the Hydro Electric Commission of 1·6d/unit.

No Electrification Yet

Electrification of the Brisbane suburban railway network should not be considered until the population of the city had reached at least 600,000. That view was expressed by the Queensland Transport Minister, Mr Chalk, on his return from a study of rail and road problems in the UK and USA. He favoured the immediate co-ordination of buses with diesel-drawn trains for use within the environs of the city of Brisbane.

Own Plant

Having given notice to Kalgoorlie Electric Light and Power Corporation Ltd. to end its bulk supply agreement, North Kalgurlie (1912) Ltd., of Western Australia, has announced that it is to spend some £300,000 on the installation of four 1,650 h.p. diesel engines to form the company's own power plant. By that means the latter hope to save over £30,000 a year on its power bills, according to Mr F. A. Davis, general manager.

NEW ZEALAND

Benmore Plant

An order worth $3 million for the supply of six 90 MW generators for New Zealand's Benmore hydro-electric scheme has been awarded to Canadian General Electric Co. Believed to be the largest equipment of the type ever exported from Canada, the generators will be 33 ft dia and 18 ft high.

Company Activities

WE are, indeed, passing through very anxious days. The Chancellor has said it once and he will almost certainly say it again. With productivity virtually at a standstill, prices on the upswing and a fresh round of wage claims in the offing, it would be surprising if he were not anxious. But whereas last week Mr Lloyd was anxious about the general symptoms of inflation, City men were anxious about the specific cure. Armed with the sword of selective purchase tax adjustments and buckler of a payroll levy, the Chancellor's awesome shadow bestrode Throgmorton St like a colossus—eclipsing even the brightest stars in the financial firmament.

News of a £47 million fall in the sterling area's gold reserves during June brought further growls from the bears and in three days the *Financial Times* industrial index plummeted nearly 14 points to 308·1—more than 55 points below its mid-May peak. Stags leapt into the Max Joseph-Isaac Wolfson new issue, Mount Royal, but old-established shares were left on the shelf. On Thursday, however, the "No Change" board went up at the Bank of England and bargain-hunters were back in Town. Rallying with relief, favourites such as Associated Cement, Guest Keen, ICI and Marks and Spencer—which had dropped 3s to 4s apiece—made good about half their losses.

With markets as nervous as a litter of kittens, no news was good news. Announcing a £15 million rights issues, Colvilles crashed over 10s — leaving investors with the paradoxical prospect of having to pay more than the market price for their "cheap" steel shares. Tobaccos were set gasping by the Monopolies Commission, which had smoked out Imperial's 42½% stake in Gallaher and suggested that this business friendship was too close for public comfort. And when Barclays disturbed the banks' interim season by sounding a cash call they gave way 11s 6d before recovering to close the account 3s in the red.

Against this sombre background, where a spectacular profit showing failed to save Associated British Pictures from a first-night flop of 4s, electricals put on a rather patchy performance. Component specialists were among the hardest hit, with Colvern depressed 2s 10½d in spite of record results and a bumper pay-out. Plessey registered an identical loss, while Decca spun back 4s 6d and profit-takers put a 3s minus sign against Ultra. In the television relay field, Rediffusion dimmed 3s 3d after chairman John Spencer's report of tougher trading conditions.

On the heavy side, Parsons and Reyrolle both lost weight but the "Big Three"—AEI, English Electric and GEC —stoutly resisted the tendency to slim. Elsewhere automation counters ICT and Elliott-Automation—two of the few firms who actually stand to gain from a payroll tax—held remarkably steady. Even in these anxious days, canny operators are clinging to their growth stocks.—*From our City Correspondent.*

Belliss and Morcom

A substantial contract has been entered into for the manufacture of a non-competing American product under licence and there are good prospects of similar work, says the chairman. Shareholders will probably ask for details at the annual meeting on 26 July at Birmingham.

Colvern

Riding on the wave of the electronic industry's prosperity, pre-tax profit has risen from £221,615 to a record £264,007, and dividend is raised from 35% to 37½% with the final 27½% payable on capital increased by a one-for-two scrip issue in February this year. After £130,813 tax (*£106,091*), net profit comes out at £133,194 (*£115,524*), of which ordinary dividends absorb £67,294 and preferences a further £3,001.

Combined Electrical Manfrs.

Formed to effect the merger of Hackbridge and Hewittic with Switchgear and Cowans, this holding company is paying a 12½% dividend as forecast. Group trading profit of £715,759, before tax, includes a year's results of Hackbridge and Hewittic, with the exception of the Bertram Thomas subsidiary which is for 10 months, and 15 months from Switchgear and Cowans. Adjusted to an annual basis, earning rate is estimated at £675,000 against a forecast £700,000.

Edwards High Vacuum

The intended rights offer will raise about £850,000, the chairman announces. The basis for issue will be disclosed at or before an extraordinary meeting on 25 July. Profits for 1961, says the chairman, should enable the 15% dividend to be maintained on the increased capital.

Electric Construction Co.

The unsatisfactory results of the past year reflect the unsettled conditions of the electrical manufacturing industry, says Mr C. Reid in his annual review. One of the difficulties has been the shortage of skilled manpower. The parent company's order book is the longest ever, and efforts to increase production together with growing sales of new products encourage an optimistic outlook. Overseas subsidiaries have full order books.

Electronic Rentals

Plans for further development lead the chairman to hope for an increase in profit this year.

Ferranti Ltd.

It is still too early for the effects of the court's decision against the transformer price agreement to be fully apparent, but the view that its discontinuation should not lead to a depression of margins below an economic level is "open to considerable doubt," says Sir Vincent de Ferranti in his annual report.

Greenwood and Batley

The recovery from the partial recession in the winter of 1959-60 came too late to affect output in the early months of the year under review, to 31 March, and trading profit dropped from £224,362 to £127,635. The 15% dividend on reconstructed capital is, however, equivalent to the previous year.

Hallam, Sleigh and Chesterton

Net profit is up from £65,091 to £83,647, and a 2½% bonus is being added to the 17½% dividend for the year to 31 Dec. Full payment in the previous year was 17½%.

Hawker Siddeley

The two electrical subsidiaries, Brush Electrical and Fuller, have both done very well indeed, says Sir Thomas Sopwith in his report on group activities for the 17 months to 31 Dec. Brush locomotives have maintained a remarkable delivery schedule and are giving excellent service on British Railways, he adds.

Keith Blackman

The high level of activity in the engineering industry in the past year is reflected in this balance-sheet. Working to "absolute full capacity," the company lifted trading profit by £41,339 to £259,616. After tax, net profit comes out only slightly higher at £123,456 (*£122,410*), of which the steady 17½% dividend asborbs £64,312.

Lightfoot Refrigeration

Now that losses have been cut on the ill-fated domestic refrigerator venture, directors view the current year with cautious optimism; but they find it too early to say whether a resumption of dividends will be warranted. A hopeful and topical sign is that the partnership in Kuwait, only a few months old, has already produced a small profit.

Newrith Group

The year has turned out better than the chairman expected, though the earning rate is still only about a quarter of that in 1958-59. Dividend for the year to March is raised from 4% to 6% and non-taxable capital distribution is doubled to 2½%. Preliminary net profit, after £21,987 tax (*£15,378*), is up from £15,676 to £24,593, of which Ordinary dividend takes £12,495.

Pyrotenax

Group turnover rose by 12½% in 1960-61 over the very satisfactory level

of the previous year, the chairman reports. Exports of the parent company did particularly well, increasing by nearly 30% and passing the £1 million mark for the first time. The new manufacturing subsidiary in Australia lived up to expectations and substantially offset lower results in Canada.

Richardsons, Westgarth

There is a sting in the tail of Mr O. J. Philipson's annual review—"The figures which will be presented this time next year are bound to show a substantial loss," he says. This will bring shareholders up with a jolt, but they will appreciate the chairman's honesty. Clearly, the struggle against fierce competition and rising costs is only growing worse. Orders on hand and works in progress amount to £31½ million, only 10% lower than this time last year, but Trawsfynydd accounts for a considerable amount of this and, with the marine market slack, it seems difficult to maintain balance. Diversification is under way, but is unprofitable in the early stages. An additional burden in the current year will be the greater responsibility for design following the alignment with GEC on conventional power projects and the consequent termination of the Brown Boveri licence. The coming year looks like a period of adjustment, but the steel and fuel price clouds have burst and payroll tax threatens on the horizon.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price‡ High	Ord. Price‡ Low
1957	1,560,492	655,191	47·3	16⅔	20/7	13/6
1958	1,870,601	658,624	19·4*	11⅔*	16/-	11/-
1959	1,782,862	610,651	17·1	8⅓	16/1	11/-
1960	1,519,773	230,900	6·4	8⅓	15/-	5/11
1961	1,228,996	67,042	1·8	—†	9/1	6/-

* On capital increased during the year by a one-for-one scrip issue. † There is a capital distribution of 1¼%. ‡ Calendar year, except 1961 which is up to 5 June.

Sterling Industries

The ship-owning Cayzer interests are revealed as the party interested in gaining control. Detailed proposals could not be prepared before the second bid from Vokes was due to close, but in the meantime Cayzer interests are offering cash of 21s per Preference share and 1s 1½d Ordinary.

John Thompson

Nuclear losses total £1·2 million within the group and up to another £850,000 from AEI-John Thompson Nuclear Energy. After allowing for the potential profit had the productive facilities been engaged on other work, the financial position has worsened by about £3 million, says Sir Edward Thompson. Having omitted the final dividend for the past year, there is every prospect of paying ordinary dividends in 1961, beginning possibly with an interim on 1 Nov. Work on hand is worth over £38·4 million.

Ward and Goldstone

In the past couple of years, record sales by cable firms have by no means implied a record profit, but this company managed both. Now they are poised for an even greater drive on home and overseas markets. A former cotton mill of 250,000 sq ft, purchased in 1959, became fully operative last December and production at another 350,000 sq ft factory for wiring harnesses and cable assemblies has just begun. "I am relieved to say," adds Mr Sampson Goldstone, "that we are at last reaching the completion of a vast redeployment in some of our older factories."

Dividend Declared

Chloride Electrical Storage. Interim is raised from 5% to 7½%, but does not indicate an increased total.

NEW LITERATURE

Boiler House Practice

by J. N. Williams, M.I.C.E., M.I.MECH.E.

THE third edition of this book, which was first published in 1953, has been brought up to date and now includes references to the influence of the clean air act on fuel technology and the prevailing fuel supply situation. Opening chapters deal with theory and practice of combustion, heat transmission and steam generation. Both shell and water-tube boilers and auxiliary are well covered. The author's style is very readable and the text is broken up by nearly 240 line and half-tone illustrations. Although intended primarily for the practising steam engineer, for whom it contains a wealth of practical information, it will also be found invaluable by electrical engineers who want to know something of boiler operation. In this connection, the water tube boiler receives fairly extensive treatment and there are chapters on boiler control, boiler feed pumps and water treatment processes. Published by George Allen and Unwin. 648 pages, 9½ in. by 6 in. Third revised edition. Price 70s.

Electrical Theory on the Giorgi System

by P. Cornelius, DIPL.ING.

THE first English edition of this book follows previous publications in Dutch, German and French. In the first 60 pages, the fundamentals of conduction capacitance and the magnetic field are developed on the basis of the m.k.s. units system, and subsequently mechanical units are defined. The book is aimed at teachers and advanced students who will, however, notice that there are some errors and inconsistencies in the text and a few ambiguities which could have been overcome by more liberal use of diagrams. The concept of vector equations is logically introduced in the development of electrical laws. The greater part of the book is devoted to problems in electrical theory which range from a consideration of long conductors to the magnet circuit of transformers and the behaviour of electron beams in electric and magnetic fields. Merits of the m.k.s. system are expounded in another chapter and the book concludes with a historical note and useful tables of formula and conversions to other systems of units. Published by Cleaver-Hulme Press. 187 pages, 5¼ in. by 8½ in. Price 32s.

Newnes Electrical Pocket Book

THIS popular little pocket-book has now reached the fifteenth edition; and the foreword claims that, apart from the introduction of a number of new references to such modern developments as the fuel cell, solar batteries and superconductivity, the whole of the contents have been revised. It is, therefore, a pity that Table II on page 165 should have appeared so shortly before the release of the new IES code, since the values given are now completely out of date. Another noticeable omission is reference to semiconductor diodes in the rectifier section since, for the practical electrical engineer, these are of more importance than the transistors. Published by Geo. Newnes, 387 pages, 6¼ in. by 3¼ in. Price 10s 6d. Fifteenth edition.

Problems in Electronics with Solutions

by F. A. Benson, D.ENG., A.M.I.E.E., M.I.R.E., F.I.E.S.

THIS second revised and enlarged edition follows only three years after the first. Intended to aid the undergraduate to apply theoretical knowledge to practical problems, the book also contains some problems extending into post-graduate studies. New problems in the second edition deal with mesh and nodal analysis. Laplace transforms, transcircuitry, application of matrices and gaseous and plasma phenomena. The sections on transients, waveform analysis and four terminal networks have been expanded. Numerical solutions follow each problem, but the worked solutions are collected at the end of the book. The book contains 302 problems and adequate solutions are given to most of these. There are, however, about 50 problems for which the reader is referred to other sources for the solutions and some of these may not be readily available. Published by E. and F. N. Spon Ltd., 249 pages, 8½ in. by 5½ in. Price 42s.

History of Flow Measurement by Pressure Difference Devices

THIS is a reprint of a number of articles which appeared in the *Instrument Engineer* from April, 1952, onwards on the historical background of modern water-flow meters operating on differential across a venturi-tube or orifice plate. It contains a wealth of technical information. Published by Geo. Kent, Luton, 52 pages, 11 in. by 8½ in. (card covers). Price 10s.

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London N.1. Tel. TERminus 9631/2.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

14 July—Aberdare U.D.C. Supply and installation of new synchronous striking clock to replace existing movement, Hirwaun War Memorial.—See 29 June issue.

14 July—S. Wales E.B. Installation of rising mains and lateral services to two 11-storey blocks of flats, Sketty Park housing estate.—See 6 July issue.

14 July—Wexford C.C. Avenue lighting installation, St. Senan's Hospital.—See 6 July issue.

14 July—Wortley R.D.C. Supply and installation of 40 "Highway" concrete columns with "Brampton" lanterns, lamps and control gear for Group "A" colour-corrected lighting.—See 22 June issue.

15 July—Dronfield U.D.C. Supply and installation of lighting and socket-outlet points in 35 houses, Fletcher Ave estate.—See 29 June issue.

15 July—Rochester C.C. Erection of 500 Class "B" concrete columns together with the supply and fitting of equipment.—See 22 June issue.

17 July—Bedfordshire C.C. Electrical installations in: (a) new £50,000 court house, Dunstable; (b) £25,000 adaptations and improvements, The Cedars, Ampthill; (c) £20,000 alterations and extensions, Houghton Regis C.P. School. Applications to County Architect, Shire Hall, Bedford.

17 July—Harlow U.D.C. (1) Provision and erection of 18 concrete columns and 140 W sodium lighting on A11; erection and wiring of: (2) 19 Group "A" concrete columns, fitting lanterns, etc.; (3) 32 Group "B" columns with lanterns. Engineer and Surveyor: A. W. R. Webb, Town Hall. Deposit £2 2s.

17 July—Luton B.C. Erection and wiring of 720 Class "B" concrete columns. Borough Engineer, Town Hall. Deposit £2 2s.

17 July—Manchester C.C. Electrical installations in 744 houses and flats, Handforth. —Advertised 29 June issue.

18 July—West Lothian C.C. (Sub-contract 7). Electrical work in four houses, Uphall Station. Applications to County Clerk: J. Calder, County Bldgs, Linlithgow, by above date.

18 July—Worksop R.D.C. Supply and installation of two pumps for sewage at rate of 375 g.p.m. against 33 ft head; and two pumps for sludge at rate of 100 g.p.m. against 42 ft min. head.—See 29 June issue.

19 July—Ashford (Kent) U.D.C. Rewiring of council dwellings on fixed-price basis. Surveyor, 1 Elwick Rd.

19 July—Co. Westmeath. (b) Lighting, heating and power installations in St. Mary's Hospital, South Hill, Delvin.—See 6 July issue.

19 July—Tandragee R.D.C. Electrical installations in 14 houses, Ballylisk.—See 6 July issue.

20 July—Lancs C.C. Electrical installation in Coppull and District County School. Applications to County Architect, P.O. Box 26, County Hall, Preston.

20 July—Manchester C.C. Contract 250B. Electrical installations in 68 Hazel Grove dwellings.—Advertised 6 July issue.

20 July—Morecambe and Heysham B.C. Renewal of wiring and ancillary works in Town Hall.—Advertised 6 July issue.

21 July—N.I. Hospitals A. Provision of electrical services at Downe Hospital, Downpatrick. Applications to Secretary, 27 Adelaide St, Belfast 2, by above date.

21 July—Perth C.C. Supply and installation of 47 units Group "A" sodium lighting. A9, Aberuthven, Blackford.—See 29 June issue.

21 July—S. Wales E.B. Installation of rising mains and lateral services to two 11-storey flat blocks, Brynmelyn Redevelopment, Swansea. District Manager: I. G. Evans, Strand Offices, Swansea.

22 July—Cuckfield U.D.C. Erection only of 40 octagonal street lighting columns and three wall mounting fittings with control gear.—Advertised 6 July issue.

24 July—Coseley U.D.C. Erection of street lighting units during year comprising 98 Group "B" and three Group "A" units with the probability of a further 34 Group "B" and eight Group "A." Council Clerk: J. C. Roper, Council Hse. Deposit £2.

24 July—Sligo. Installation only of electrically heated laundry and cooking equipment and removal of existing steam heated equipment in County Home.—See 6 July issue.

25 July—Belfast. Electrical installation in Lombard Youth Club, Tower St, for Irish Temperance League.—See 6 July issue.

25 July—Ilford B.C. (a) Erection and connection of approx. 1,200 columns and lanterns; (b) cable laying, jointing and trenching; and (c) thrust boring, in Group "B" street lighting, stage IV.—Advertised 29 June issue.

25 July—Ilford B.C. Removal of 424 trolley bus poles.—Advertised 6 July issue.

26 July—Larne B.C. Supply and erection of Group "A" fluorescent street lighting at Antiville Rd: 25 2 x 80 W 5 ft tilted lanterns on 25 ft concrete columns and one 3 x 80 W.—See 6 July issue.

27 July—Hyde B.C. Supply/erection of 75 25 ft concrete columns with 76 140 W sodium lanterns/gear, plus removal of 37 existing units. Borough Engineer and Surveyor, Municipal Bldgs, Greenfield St.

27 July—Newbury B.C. Supply and erection of 713 Group "B" lanterns, 697 columns and 16 wall brackets, together with lamps, wiring and gear.—Advertised 6 July issue.

28 July—N.I. Housing Trust. Electrical installation in three-storey block, Russell Drive, Lurgan.—See 6 July issue.

29 July—Darlaston U.D.C. (a) Resiting of Class "B" concrete columns; supply and erection of: (b) Class "A" concrete columns: (c) Class "B" concrete columns. Engineer and Surveyor, Victoria Park. Deposit £2 2s.

29 July—Dublin T.C. Electrical installation in fire station at Dolphins Barn. 28-29 Castle St. Deposit £6 6s.

29 July—Weymouth B.C. Supply and erection of 145 Group "A" concrete columns and lanterns. Columns to be octagonal design, Stanton Ironworks. Lanterns to be S.O.50 design manufactured by A.E.I. Lamp and Lighting.—See 6 July issue.

31 July—Cardiff C.C. Contract B.4. Supply and installation of passenger lift at Sluvad, Panteg, water treatment works. Engineer, Waterworks, Llandegfedd Water Scheme—Section B, Sluvad, Panteg.

31 July—North Armagh Hospital Management Committee. Installation of wiring, Lurgan and Portadown Hospital. Registered contractors only.—See 29 June issue.

1 Aug.—Lytham St. Annes. Supply and erection of two 3,500 g.p.m. at 19 ft head vertical centrifugal sewage pumps complete with motors.—See 22 June issue.

1 Aug.—Ramsbottom U.D.C. Installation of Class "A" sodium lighting, 20 columns, Blackburn Rd.—See 6 July issue.

2 Aug.—Birmingham C.C. Servicing and maintenance work on lifts in public buildings and schools.—See 6 July issue.

4 Aug.—Belfast T.C. Supply, delivery and erection of 33 kV and lower voltage cables and accessories.—Advertised 29 June issue.

4 Aug.—Edinburgh C.C. Electrical installation, new police station, Gayfield Sq.—See 29 June issue.

5 Aug.—Orrell U.D.C. Supply, erection and wiring complete with lanterns/gear of 44 Group "B" street lamps on various estates. Engineer.

9 Aug.—Wortley R.D.C. Supply and installation of street lighting in five groups. (1) 93 15 ft columns with 80 W mercury lamps; (2) 31 20 ft columns with 125 W lamps; (3) 26 25 ft columns with 3 x 80 W fluorescent tubes; (4) 68 25 ft columns with 250 W mercury lamps; (5) 77 20 ft and 15 ft columns with 125 W and 80 W mercury lamps.—See 29 June issue.

14 Aug.—E.B. for N. Ireland. Specification NI.1635. Supply and installation of 400 V switchgear at Coolkeeragh Power Station.—See 22 June issue.

14 Aug.—E.B. for N. Ireland. Specification N.I.1736. Supply and erection of 33 kV 750 MVA metal-clad indoor switchgear. Details from consulting engineers: Kennedy and Donkin, 12 Caxton St, S.W.1. Deposit £5 5s.

18 Aug.—Londonderry C.C. Wiring of old people's home at Moneymore. Details from architects: Dalzell and Campbell, The Diamond, Coleraine. Deposit £5.

21 Aug.—Enniskillen R.D.C. Supply and installation of water pumping plant for Marble Arch scheme. Details from consult-

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 114 queries answered this week

"Nulux" irons—makers of? L.E.B.—T. Price and Son (Stampers) Ltd., Spring Hill Passage, Spring Hill, Birmingham 18.

"Brownie" waffle cookers—makers of? E.E.W.—S.L.R. Electric Ltd., Cranbourne Industrial Estate, Cranbourne Rd, Potters Bar, Middx.

"Arthur Martin" refrigerators—agents for? M.G.—Layford Trading and Shipping Co. Ltd., 7 Chesterfield Gdns, W.1.

"Tern" washing machines and refrigerators—makers of? T.E.—The manufacturers, Tern Electrics Ltd., Mansfield, Notts, are no longer in business.

"Gregg" ceiling rose—address for? F.R.—Ranton and Co. Ltd., 6 Commerce Rd, Brentford, Middx.

New flexible, butyl rubber insulated cable referred to by "Megohm" in the "Electrical Times," dated 29 June, 1961—makers of? S.E.E.B.—The General Electric Co. Ltd., Magnet Hse, Kingsway, W.C.2.

Razor sockets with companion isolating transformers—makers of? W.L.—Chilton Electric Products Ltd., Hungerford, Berks; Kentish Electrical Co. Ltd., 112 Albany St, N.W.1.

"Castor Drymatic" washing machines—suppliers of? S.E.E.B.—Relax Domestic Appliances Ltd., 2 Victoria St, S.W.1.

ing engineers: W. D. R. and R. T. Taggart, 13 College Gdns, Belfast 9.

26 Aug.—Bradford B.C. Installation of electric wiring, three dwellings, Scar Hse Reservoir, Harrogate.—See 29 June issue.

1 Sept.—Cambridge C.C. Supply: lamps.—See 6 July issue.

4 Sept.—Northern Ireland E.B. Main generator/generator transformer connections for No. 4 60 MW turbo-generator.—See 6 July issue.

No date stated—Carlisle B.C. 40 Group "A" lighting units and 142 Group "B" units on various estates; 14 Group "A" and 48 Group "B" units on Morton housing estate.

. . . and Overseas

Details of items marked • may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.

18 July—America. One transformer complete except bushings, three-phase, 67,000-7,620/13,200 V. Public Utility Dist. No. 1, Clallam County, Port Angeles, Washington. B.o.T. (ESB/21021/61).•

22 July—Iraq. Supply and delivery of time switches. Directorate General of Municipalities, Baghdad. B.o.T. (ESB/21017/61).•

22 July—Iraq. Supply of 2½, 5 and 10 A a.c. meters. Directorate General, Ministry of Municipalities, Baghdad. B.o.T. (ESB/21019/61).•

25 July—Burma. 300 200 W 230 V lamps. Director-General, Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/21894/61).•

25 July—India. Switchgear h.t. (three lots). Director-General of Supplies and Disposals, Shahjahan Rd, New Delhi. B.o.T. (ESB/21889/61).•

26 July—India. 32 300 g.p.m. 250 ft head electrically driven centrifugal pumping sets. General Manager, Singareni Collieries Co. Ltd., Bhadrachellam Rd Station, Deccan. B.o.T. (ESB/20968/61).•

26 July—Kuwait. 141,500 ft conduit. Dept. of Electricity, Water and Gas. B.o.T. (ESB/22048/61).•

29 July—India. Steel tubular poles for transmission lines. 400 36 ft, 300 30 ft and 300 25 ft. General Manager, Singareni Collieries Co. Ltd., Kothagudium Collieries P.O., Bhadrachellam Rd Station, Deccan. B.o.T. (ESB/20966/61).•

4 Aug.—Rhodesia and Nyasaland. Hotplates, domestic and laundry irons, kettles and urns. Secretary, Federal Tender Board, P.O. Box 8075, Causeway, Salisbury. B.o.T. (ESB/21873/61).•

4 Aug.—S. Africa. 33 VA portable testers. Director, Transvaal Rds Dept., Room 301, Veritas Bldg, Fountain La, Pretoria. B.o.T. (ESB/22421/61).•

9 Aug.—Egypt. Four 800 kW and five 1,250 kW diesel-generators for Minia weaving plant and Assyut spinning, weaving and finishing plant, respectively. Steam raising plant is also required at Assyut. Details from Tennant Guaranty Co. Ltd., 4 Copthall Ave, E.C.2. B.o.T. (ESB/22069/61).•

11 Aug.—South Africa. 20 electric motor driven double stone floor grinders with 17 dust extraction units. Stores Department, South African Railways, Johannesburg. B.o.T. (ESB/20987/61).•

18 Aug.—India. 19 items of cables and accessories. Director-General of Supplies and Disposals, Shahjahan Rd, New Delhi. B.o.T. (ESB/21024/61).•

18 Aug.—India. Tender S.E.386. 3,150 V and 415 V metal-clad switchgear for the D.V.C. in Chandrapura Thermal Station. Details, fee £1 1s, from Co-ordination Branch, India Store Dept., Government Bldg, Bromyard Ave, W.3. Viewing reference S 3063/61/NSC/ENG 2.

18 Aug.—S. Africa. Three electric motor driven wheel lathes, three sets of lighting equipment. Chairman, Tender Board, S.A. Railways, P.O. Box 7784, Johannesburg. B.o.T. (ESB/20440/61).•

29 Aug.—Iran. Three 1,000 h.p. diesel-generators. General Admin. of Cereals and Bread, Tehran. B.o.T. (ESB/21808/61).•

26 Sept.—India. Switchgear for Phagwara substation. Chief Engineer (North), Punjab S.E.B., 9 Ram Bagh Bldg, Patiala. B.o.T. (ESB/21890/61).•

27 Sept.—Nigeria. 132 kV single-circuit transmission lines: 45 mile Kaduna/Zaria and 85 mile Zaria/Kano. Short précis and (fee £12, made payable to E.C. of Nigeria) documents from Resident Engineer, E.C. of Nigeria, Adelphi, John Adam St, W.C.2.—Advertised in this issue.

CONTRACTS PLACED

C.E.G.B. (S.E. Region). Contracts placed during June total £148,351 and include: Acton Lane, 22 kV switchgear, A.E.I. Ltd.—Addington, 33 kV switchgear, A. Reyrolle and Co. Ltd.—Folkestone, 11 kV switchgear mods., A. Reyrolle and Co. Ltd.—Burwell, 132 kV switchgear, A. Reyrolle and Co. Ltd.—Finchley, two 30 MVA 132/6·6 kV transformers, Bonar Long Ltd.

Durham C.C. Electrical work in schools: Denton C.E. Controlled School, James Paterson and Co., £517 17s; Jarrow School Clinic, Northern Electrical Rewinds Ltd., £519; Staindrop new Modern School, Cox-Walkers Ltd., £9,162.

West Hartlepool T.C. Electrical work in West Hartlepool Girls' High School additions, R. V. Hogg and Co. Ltd.

Whitley Bay B.C. Supply of 60 400 W mercury lamps/lanterns/gear, Abacus Municipal Ltd.

Gazette Announcements

COMPANIES ACTS

Joseph E. Brookes (Electrical Appliances) Ltd. Creditors to send details to liquidator, P. J. Snow, 17 Albion St, Hanley, by 4 Aug.

Gate Electronics Ltd. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 14 July, at 2.30 and 3 p.m., respectively.

BANKRUPTCY ACTS

Receiving Orders

Brighton. H. C. Summers, cycle, electrical and hardware dealer, formerly carrying on business at 2 Bennett Rd. Order dated 22 June.

Eastbourne. F. G. Vincent, radio, TV and electrical dealer, formerly carrying on business at Wellsley Hse, High St, Westham, Pevensey. Order dated 21 June.

Bradford. W. D. Edmonds, electrical dealer, of 36 Albert St, Thornton, Bradford. Receiving order dated 26 June.

Croydon. M. H. Gibson, carrying on business as Housewives Electrical Aids, 17 Vincent Rd, S.E.18. Receiving order dated 26 June.

Liverpool. J. E. Oultram, electrical contractor, formerly carrying on business at 55 Mersey Rd, Widnes. Receiving order dated 22 June.

Rochester. Radio and Electrical Service, electrical dealers, formerly carrying on business at 99 Barnehurst Rd, Barnehurst. Receiving order dated 21 June.

First Meetings and Public Examinations

Croydon. E. G. Page, electrical contractor, carrying on business as Jim Langley, of 33 Heathhurst Rd, Sanderstead. First meeting: 11 a.m., 13 July, at 58-61 York Terr, Regent's Pk, N.W.1; and public examination: 11 a.m., 5 Oct., at County Court, Scarbrook Rd, Croydon.

Eastbourne. F. G. Vincent, radio, television and electrical dealer, carrying on business at Wellesley Hse, High St, Westham, Pevensey. First meeting: 11 a.m., 14 July, at Official Receiver's Office, 8 Old Steine, Brighton 1; and public examination: 2 p.m., 28 Sept., at Town Hall, Eastbourne.

Intended Dividends

Norwich. G. R. Overton, radio and electrical engineer, carrying on business at Rockland All Saints, Attleborough. Last day for receiving proofs for intended dividend, 14 July, by trustee, C. A. Taylor, Norfolk Hse, Exchange St, Norwich.

High Court of Justice. P. H. Mathews, manufacturer of ironware and electrical fittings, carrying on business at 32 Parkfield St, N.1. Last day for receiving proofs for intended dividend, 18 July, by trustee, E. C. Sherwood, Bankruptcy Bldgs, Carey St, W.C.2.

Nottingham. H. Smith, electrical engineer, formerly carrying on business at The Old Bakery, South Clifton. Last day for receiving proofs for intended dividend, 18 July, by trustee, N. Temple, 185 High St, Lincoln.

Cardiff. K. M. Seward, radio, television and electrical dealer, carrying on business at 2-4 St James Arcade, Newport Rd, Roath. Last day for receiving proofs for intended dividend, 20 July, by trustee, G. H. Dawn, 106 Walter Rd, Swansea.

Plymouth. D. Boulton, wireless and electrical engineer, formerly carrying on business in partnership at Old Town Ave. Last day for receiving proofs for intended dividend, 18 July, by trustee, A. D. Gwyther, Royal Bldg, St. Andrew's Cross, Plymouth.

TRADE NOTES

Change of address. Allen and Pope Ltd. have now moved to 1 Birkbeck Mews, Sandringham Rd, Dalston, E.8. The telephone number remains Clissold 6488.

Expansion. Dansette Products Ltd. have acquired a 30,000 sq ft factory in North West London, formerly used by Raymond Electric.

Geneva link. The Rheostatic Co. Ltd. and Robertshaw Controls S.A., of Geneva, have entered into agreements covering two-way co-operation in a wide variety of devices in fields of common interest. Robertshaw Controls S.A. is a subsidiary of Robertshaw-Fulton Controls Co., of Richmond, Virginia, U.S.A., a leading manufacturer of thermostatic and other control devices.

New factory. Morley's Electrical Services (Holloway) Ltd. have acquired a Thetford factory to which they are this month transferring production of fluorescent lighting equipment.

Reorganisation. Concerning the production reorganisation and closing down of the Luton Works of Jackson Industries Ltd., to which we referred last week, it is now stated that until further notice orders should continue to be sent as follows: Jackson domestic cookers, refrigerators, water heaters and convectors—Electrical Division of Radiation Ltd., Dallow Rd, Luton; for Parnall home laundry equipment and suction cleaners—Electrical Division of Radiation Ltd., Parnall Works, Yate, near Bristol; and for electrical catering equipment to Radiation Catering Equipment Ltd., Radiation Hse, North Circular Rd, N.W.10.

Scottish agents. Fraser Electronics and Communications Ltd., 1,103 Argyle St, Glasgow C3, are now acting as sales agents for Hughes International (U.K.) Ltd., covering the sale of silicon and germanium semiconductor diodes and capacitors in Scotland.

Transfer. The Coal Preparation and Mining Division of Simon-Carves Ltd. is being transferred to Carlisle and after 31 December, 1961, their address will be: Simon-Carves Ltd., P.O. Box No. 26, Durranhill, Carlisle.

U.S. classification. The United States Bureau of Customs has now ruled that certain electrical energy units are now to be classified as parts of flashlights under paragraph 353 of the 1930 Traffic Act, and will carry a duty of 35% *ad valorem*, as from 29 Aug.

BUSINESS PROSPECTS

Andover B.C. Tender: 44 dwellings, London Rd housing site; proposed: 44 flats on same site. Engineer.

Ashford (Kent) U.D.C. Tender: 113 dwellings, Beaver Grn. Surveyor, 1 Elwick Rd.

Ayr. Murrayfield Real Estate Co. Ltd., 62 St. James's St, S.W.1, plan £250,000 hotel and shopping centre on Dalblair Hotel site.

Basildon New Town. Chesterfield Properties Ltd., 8 Chesterfield St, W.1, propose cinema/shops; architects: Sir John Burnet, Tait and Ptnrs., 10 Bedford Sq, W.C.1.

Belfast. £100,000 studio block extension planned at Ormeau Rd for Ulster Television Ltd. P. F. Kerr Ltd., 64 La Salle Drive, are contractors for major extensions, United Breweries Ltd., Glen Rd.

Berks C.C. E.C. approved £263,286 girls' grammar school at Imperial Rd, Windsor.

Birmingham C.C. Tender: two- and four-storey dwellings, Heneage St, Nechells Grn. City Architect.

Bolton. Planned: Halliwell Mills extensions for Greenhalgh and Shaw Ltd.

Bootle C.B.C. Tender: 36 Litherland Rd dwellings. Surveyor.

Boston B.C. Tender: 58 Wood Farm Rd houses. Engineer.

Bournemouth B.C. Planning consent granted for ten-storey Municipal College extension.

Bray. Bray Court Properties Ltd., Windsor Rd, Bray, propose flats, warehouse, offices, etc., at Bray Court.

Brentford. Planned: Rebuilding of Trico-Folberth Gt. West Rd factory.

Brighton. Second and third stages of Bexhill Rd factory proposed for Jaycee Furniture Ltd.

Bristol C.C. Recreation centre for handicapped people planned at Gainsborough Sq, Lockleaze, at cost of £100,000. £150,000 offices proposed by Grensham Investments Ltd.; architects: Redwood, Miles and Willis, 18 Gt. George St.

Broadstairs. F. G. Minter Ltd., 4 Buckingham Gate, S.W.1, to erect factory for Industrial Colours Ltd., Walham Hse, Walham Grove, S.W.6.

Buxton B.C. Tender: 50 Victoria Park estate houses. Engineer.

Cambridge C.C. Tender: Arbury Rd North nine-classroom 16,000 sq ft primary school. City Surveyor.

Cardiff R.D.C. Tender: 16 flats and eight maisonnettes, Hollybush estate, Whitchurch. Engineer.

Cheadle and Gatley U.D.C. Tender: 19 dwellings, Councillor La. Housing Officer.

Croydon B.C. Plans submitted: factory, etc., for D. J. W. Osborne, c/o Hooker and Rogers, 23-31 George St; King Henry's Drive factory extensions for Ogden, Smith and Hussey Ltd.; printing works, Wandle Rd, for Croydon Times, 102 High St; factory at 445 Brighton Rd, for C. J. Neuman Ltd. Cranleigh Gp Ltd., 109 Princess St, Manchester 1, plan offices/shops/cinema at North End; architects: Andrews, Emerson and Sherlock, 63 Dean St, W.1. Plans submitted: office block at 9 Dingwall Ave, for Rodwell Estates Ltd., 8 Hertford St, W.1; offices, etc., at 54a-58 Dingwall Rd, Wettern Property Co. Ltd., 56 Dingwall Rd; office block at Wellesley Rd and Walpole Rd, for Plinth Property Investments Ltd., c/o Levison and Ptnrs., architects, 9 Mansfield St, W.1; three-storey shops/offices block, Brigstock Rd, for Stanhope Securities Ltd., 19 Exhibition Rd, S.W.7.

Cumbernauld D.C. Tenders: (i) single-storey factory on Wardpark 3 site of 6,400 sq ft production and 1,800 sq ft admin. area, main contract includes electrical work: (2) 3,570 sq ft medical services building at Kildrum; (3) 100,000 sq ft production and 6,200 sq ft other area factory for Thames Board Mills. Chief Architect.

Dorset C.C. Tender: extensions, Lyme Regis Grammar/Modern School. Architect.

Dunbarton C.C. Tender: 286 houses at Tullichewan. County Architect.

Durham. Cordingley and McIntyre, Owengate, Durham, to prepare plans for Durham Private School additions. I. Berriman Ltd., builders of Fencehouses, plan five-storey flats at Framwellgate Moor and houses on 1-3-acre at Pity Me. Eldorado Ice Cream Co. Ltd., Stamford St, S.E.1, propose warehouse/offices, etc., at Gilesgate Moor, Belmont.

Earby. Earby Light Engrs. Ltd., Old La, propose two-storey works additions.

Esher U.D.C. Tender: matron's flat and 19 aged persons' flatlets. Engineer.

Fleetwood (Lancs.). Development of 1,500 dwelling houses, 200-acre Larkholme Estate at West Shore, planned by Fleetwood Estate Ltd., 29 Queen's Terr.

Glasgow. M. of Aviation proposes terminal buildings to cost £1 million at Abbotsinch Airport; architect: Sir Basil Spence, 40 Moray Pl, Edinburgh 3.

Gloucester. Hoffman Gloucester Ltd., Stonehouse, Glos, propose new factory.

Grantham T.C. 1961 building programme is for 354 houses. Town Buildings Ltd., Grantham, plan shops/maisonnettes and flats on North/Brook/Brownlow/Broad streets site.

Grimsby. T. W. Bygott, builder, 62a Brighowgate, to develop 55-acre estate.

Guildford B.C. Tender: 67 pairs houses at Park Barn. Engineer.

Harrogate. New factory/offices at Chatsworth Rd proposed for Harrogate Optical Co. Ltd., Grove Park Wks.

Hastings B.C. To obtain tenders for £246,881 grammar school. Revised scheme proposed for £120,000 high school for girls.

High Wycombe. R. Seifert and Ptnrs., 34 Red Lion Sq, W.C.1, are architects for A.V.P. (Investments) Ltd., Lane End Rd, factory/offices. J. Hawkins and Co. (Furniture) Ltd. plan Grafton St extensions.

Huntingdon and Godmanchester T.C. To erect 10,000 sq ft factory.

Inverness C.C. Tender: School at Drummond. County Architect, Inverness.

Ipswich B.C. Tender: Alterations/additions to Westbourne S.M. School. Architects: Johns, Slater and Howard, 32 Foundation St.

Leicester. Locker's Estates Ltd. and E. Alec Colman Group of Cos., 5 Hyde Pk Gate, S.W.7, plan 20 shops arcade on Royal Opera House site. C.C. recommended to approve £10,000 second stage street lighting.

Lindsey C.C. To erect new fire and ambulance station, etc., at Laneham St, Scunthorpe.

London. H. Kelly and Ptnrs., 11 Duke St, W.1, are architects for British Oxygen Co., Eastway, E. exts. factory planned at 10-12 The Cut and 2-6 Colombe St for C. Bridges Ltd., 6 The Cut, S.E.1. Trehearne and Norman, 83 Kingsway, W.C.2, are architects for showrooms/offices, 88-89 Blackfriars Rd, S.E.1, for Associated Eng. Sales Ltd. £3¼ million ten-year rebuilding programme for King's College Hospital, S.E.; architects for various schemes at hospital are Lanchester and Lodge, 10 Woburn Sq, W.C.1, and Geo. Trew and Dunn, 50 Eastbourne Terr, W.2. Offices at 13-16 George St, E.C.4, planned by F. Milton Joseph, Cashmore and Ptnrs., 3n King's Bench Walk, E.C.4. Hodder and Stoughton Ltd., Warwick Sq, E.C.4, propose extensions; quantity surveyor: S. Gordon, Finsbury Hse, E.C.2. Shops/offices planned at 9-11 Streatham High Rd, S.W., for Norwich Union Insurance Societies; architects: Scott, Brownrigg and Turner, 41 Parliament St, S.W.1. Sir John Burnet, Tait, Wilson and Ptnrs., 10 Bedford Sq, W.C.1, are architects for F. H. Rowse Ltd., Broadway 13, alterations, etc. L.C.C. Health Committee have approved £85,000 junior training centre at Basire St, N. E.C. have approved £493,650 girls' secondary school at Blakesley St, E.

Luton. Taylor St factory/offices planned for Harvey Smith (Luton) Ltd. Barclay Stuart (Plastics) Ltd., 25-27 Brunswick St, plan Taylor/Duke Streets extensions. Home Counties Newspapers plan printing works/offices at Castle St/Holly St.

Lurgan. Tender: extension to U.K. Optical Co. Ltd. factory. M. of Commerce, Room 30B, 64 Chichester St, Belfast.

Lymington B.C. Proposed £24,744 modernisation to houses, Flushards estate, Lymington and Northfield Rd, Milford.

Manchester. Salford R.C. Diocesan Trustees to erect secondary school at Nutnurst Rd. Offices/flats at Chorlton St, proposed by S. Miller (Manchester) Ltd., 47 Chorlton St. Bank premises, Swan St, proposed by Barclays Bank Ltd., 54 Lombard St, E.C.3. Leach, Rhodes and Walker, 90 Deansgate, Manchester 3, are architects for £1 million city centre offices for Metropolitan Railway Surplus Lands Co.

Maydown (Co. Londonderry). Du Pont Co. (U.K.) Ltd., 76 Jermyn St, S.W.1, to build extensive new chemical plant.

Middlesbrough. Crawford and Spencer, 91 Borough Rd, are architects for: H.E.T. (Steel) Ltd. additional offices; nursery school, Nazareth Hse, Pk Rd North, for Sisters of Nazareth; office alterations, Borough Rd, for Doberman, Richardson and Broady; and alterations in Linthorpe Rd for Viners Ltd. Kitching and Co., 21 Albert Rd, are architects for biscuit factory, Lloyd/Florence St, for Greco Bros. Ltd. and for Wellington Hotel additions, Albert Rd for Bass, Ratcliffe and Gretton Ltd. A. E. Gray and Son, builders, Tynedale St, Stockton upon Tees, to erect 220 houses on 26¼ acres, Acklam and Newham, Bridge Farm.

Norwich T.C. E.C. plan work in autumn on £207,861 City College and Art School extensions.

Oxford. Hospital Board plan modernisation: wards, £54,863; and £62,875 for kitchens at Fair Mile Hospital.

Prudhoe. Hotel proposed by John T. Bell and Son, Market Chmbrs, New Market St, Newcastle upon Tyne, at West Wylam.

St. Neots. Factory extension scheme in Priory La by R.F. Development.

Salisbury C.C. Tender: six bungalows/15 houses, 56 flats/garages, Essex Sq, West Harnham. Engineer.

Scunthorpe B.C. Recommended to seek £11,422 street lighting loan sanction.

Sittingbourne and Milton U.D.C. Tender: 46 dwellings, Cook's La, Milton. Engineer, 89 London Rd.

Southampton B.C. Tender: 16 flats, Thornhill estate; three dwellings, Harrison Rd. Engineer.

South Shields. Durham Divisional Coal Board to construct 2,000 ton/day segregation plant at Westoe Colliery.

S.W. Metropolitan Hospitals. Plan: outpatients' dept., Mayday Hospital, Croydon; Howes and Jackman, 1 Verulam Bldgs, W.C.1, recommended as architects for group laboratory alcoholic unit, West Park Hospital, Epsom.

Stanley. G. A. Pendleton, builder, Quaking Hses, South Moor, plans 54 houses at Shield Row.

Stockport B.C. Tender: three-storey block shops/flats, Taunton Ave/Brinnington Rd. Architect.

Stockton upon Tees. Plans for 159 houses, Lonesome.

Sunderland B.C. Plans prepared for stage 1, Thornhill Comprehensive School.

Surrey. C.C. to erect £50,000 home for aged and infirm at Wandle Mead, Carshalton; plan £310,000, two aged persons homes and home for infirm and temporarily sick at Walton Lodge, together with a £56,000 home for aged and infirm at Beddington.

Tynemouth T.C. Sites approved for 142 council houses.

Waterford C.C. Tender: 33 houses, St. John's Park. City Manager.

Wembley. James and Bywaters, 5 Bloomsbury Sq, W.C.1, are architects for Woodgrange Ave offices.

Wessex Hospital Board. Alan Marshall and Ptnrs., Federal Hse, Down Pl, W.6, are recommended as consulting engineers for new neurosurgical unit, Southampton General Hospital.

Worthing. Work to start in autumn on £115,000 R.C. school at Crescent Rd for Convent of Our Lady of Sion.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Balais Cleaners Co. (Provincial) Ltd., 42 Devonshire St, W.1. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £500. Dirs.: Jacques L. P. Charpin, John E. Cullimore and Alan J. Broad.

Barta Electrical Ltd. Manufacturers of and dealers in electrical goods of all kinds, etc. Nom. cap.: £1,000. Dirs.: Andrew Barta and Theodore Woolf. Subs.: Leslie W. Sinclair, 5 Pegwell Hse, Pembury Rd, E.5; and Margaret Laing, 203 Aragon Rd, Morden.

F. and R. Belbin Ltd., Exchange Bldgs, Whitley Bay, Northumberland. Sheet metal workers and electrical, mechanical and automobile engineers, etc. Nom. cap.: £1,500. Dirs.: Fred Belbin, Frank Belbin and Roy Belbin.

Cenelec Ltd., Lloyds Bank Chmbrs, Haslemere. Heating and ventilating experts, etc. Nom. cap.: £100. Dirs.: George A. Potter, Dennis J. G. Shadbolt, David M. Bradley and E. A. Gray.

John H. Chignall Electrical Ltd., 52-4 Gray's Inn Rd, W.C.1. Nom. cap.: £1,000. Dir.: John H. Chignall.

Delta Enfield Rolled Metals Ltd. To take over the businesses of manufacturers and marketers of rolled copper and brass and bronze sheet and strip and shapes cut from sheet and strip carried on by (1) Earle Bourne and Co. Ltd., (2) Alfred Case and Co. Ltd. and (3) Enfield Rolling Mills Ltd. Nom. cap.: £2,700,000. Dirs.: not named. Subs.: R. G. A. Youard, 18 Austin Friars, E.C.2; and M. Brothwood.

Global Electronic Machinery Co. Ltd., 31-32 Haymarket, S.W.1 Manufacturers of and dealers in electronic instruments, etc. Nom. cap.: £1,000. Dirs.: Samuel J. Cordell, Albert E. List and G. Pollock.

John E. Hammill Ltd., 32 Clumber St, Mansfield, Notts. To take over the business of dealers in vacuum and electrical appliances carried on as "John E. Hammill" at Mansfield, etc. Nom. cap.: £10,000. Dirs.: John E. Hammill, Clara E. Hammill and William R. Thompson.

International Systems Control Ltd., Magnet Hse, Kingsway, W.C.2. Manufacturers of and dealers in machinery and equipment, whether mechanical, electrical, electronic or otherwise, etc. Nom. cap.: £430,000. Dirs.: to be appointed by subs. Subs.: Walter Poll, 24 Monks Way, Orpington, Kent; and Peter G. Nathan, 20 Copthall Ave, E.C.2.

Lede Electronics Ltd., 107 Bedfont La, Feltham, Middx. Nom. cap.: £100. Dirs.: William T. Nunn, John C. Newson, Frederick G. Lambert, Michael G. Hope and Henry R. Still.

Marconi Instruments (Overseas) Ltd. To carry on the business of manufacturing and dealing in measuring instruments of all kinds, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: F. N. Sutherland, 83 Neville Court, N.W.8; and W. A. G. Brian, 100 Charmouth Rd, St. Albans.

Milcol Electro Eng. Ltd., 223 Edgware Rd, N.W.9. Manufacturers of and dealers in electrical and mechanical apparatus. Nom. cap.: £500. Dirs.: Anthony S. Colman, George K. Miller, Henry Young and David Woolfe.

Prudent Electrics Ltd. To carry on the business of manufacturers of and dealers in vacuum cleaners, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: S. H. Lucas and F. A. Dean, 6 Surrey St, W.C.2.

R. and R. Research Ltd. Electrical, electronic, mechanical and general engineers, to carry out research in the fields of electricity and electronics, etc. Nom. cap.: £10,000. Dirs.: Thomas M. C. Lance, 180 Bromley Rd, Beckenham, Kent; Ronald J. Milwidsky, Jeffery E. Piper, Maurice Exwood, R. P. Gabriel and R. I. Kinross.

Savair Products Ltd., Stafford Hse, Norfolk St, Strand, W.C.2. Engineers, founders, smiths, machinists, manufacturers and patentees of resistance welding equipment, pneumatic and hydraulic equipment, etc. Nom. cap.: £10,000. Dirs.: Andrew F. A. Powles and Christopher G. Tanner.

B. S. & W. WHITELEY LIMITED

New Records Achieved in 75th Year

MR WILLIAM WHITELEY'S STATEMENT

THE annual general meeting of B. S. & W. Whiteley, Limited, was held on 5 July at Torracks Hill, Pool-in-Wharfedale, Yorkshire, Mr William Whiteley, J.P. (Chairman and Managing director), presiding.

The following is his circulated statement:—

This year is the 75th in the history of our company and it is with pleasure continued progress can be reported.

The accounts for the year ended 31 March, 1961, constitute a record in many ways. Deliveries are up approximately 10 per cent on last year, a new all-time record, and direct exports also are at the highest ever level, 30 per cent higher than last year. An interesting feature of tthe export figures is the fact that last year we exported more in value than our total production in 1947, the first year after the company was made public.

In the 14 years since 1947 over one and a half million pounds has been expended on new buildings, plant, machinery and equipment, to increase production and keep modern the plant and equipment for economical working.

The amount of approximately £140,000 has been spent on capital account during the year under review, which sum has been financed from our own resources.

Directorate

The company suffered a great loss during the year in the passing of Sir Arthur Fleming whose death brought to an end a long association with a great personality, to whose courage, foresight and knowledge of electrical insulation the company will ever be indebted. His association with the company commenced in 1919 and in 1921 he was made a Director, serving until his passing in 1960. The Memorial Service held in the chapel of the Savoy served to show the esteem in which he was held in the educational, scientific and commercial fields of electrical engineering, and we mourn his passing.

During the year additions to the Board were made by the election of three new members, all of whom have held executive positions for some time, and apart from war service have been employed as to Mr D. H. Whiteley since 1936, Mr C. W. Whiteley since 1941, and Mr J. H. Whiteley since 1944. The three new Directors retire in accordance with the Articles of Association, and offer themselves for re-election.

Mr L. Musgrave the company secretary for 25 years retired in November, 1960, and his assistant Mr E. M. D. McEwan, F.C.I.S., was appointed secretary to the company. Our best wishes for a long and happy retirement go out to Mr Musgrave following his faithful service to the company, and to Mr McEwan, who has been with the company since 1941 excluding war service, we wish a successful career.

Your Directors decided that as the stock of Articles of Association was getting very low it was necessary to reprint. Opportunity would be taken to bring the Articles up to date and according to modern practice. Enclosed with the accounts are the resolutions to be proposed, together with a letter giving fuller information regarding the desired changes, which I hope will be accepted as they are in the interests of the shareholders.

The Outlook

As regards the future, it can be said that the order book is still in good shape. Selling prices have not been raised during the year notwithstanding increases in cost of labour, materials, coal and power. The increased sales with further economies in production costs helped us in the year under review, but whether we can maintain this position during the coming year remains to be seen. So much depends on factors outside our control such as the problem of the Sixes and Sevens, which at the time of writing, remain unresolved.

Once again tribute is paid to the loyalty of our Staff and Workpeople, and we move along through another year with every confidence.

The report and accounts were adopted; a final dividend of 15 per cent, less tax, making 25 per cent on the Ordinary Shares for the year, was approved, and the retiring directors, Mr H. D. Whiteley, Mr C. W. Whiteley and Mr J. H. Whiteley, were re-elected.

At a subsequent extraordinary general meeting resolutions amending the Company's Memorandum and Articles of Association were approved.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Guardsman. 812,705. Class 7. Hand-guided electrical machines and tools; drying and washing machines, etc. Houndsditch Warehouse Co. Ltd., 123-130 Houndsditch, E.C.3.

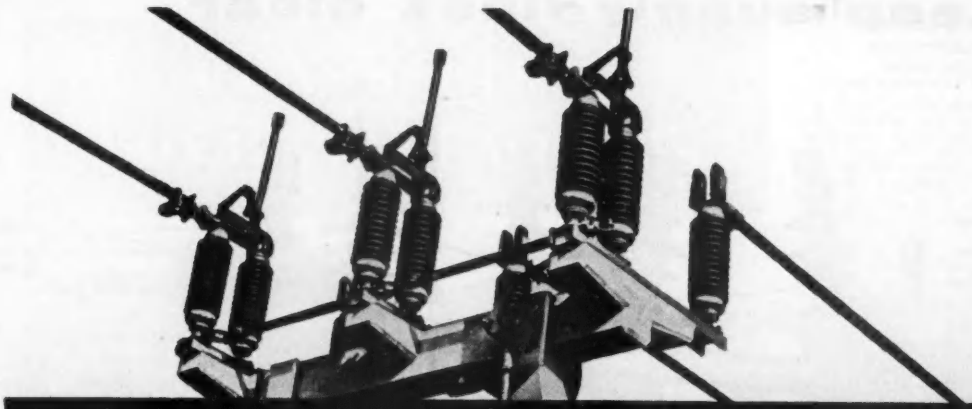
Hentoflon. 816,366. Class 17. Insulation parts, etc. Henry and Thomas Ltd., Yeo St, E.3.

Pax dictator. 815,856. Class 9. Apparatus, etc. Recorderpool Ltd., Bromley Wks, Bromley Rd, Lye, Stourbridge.

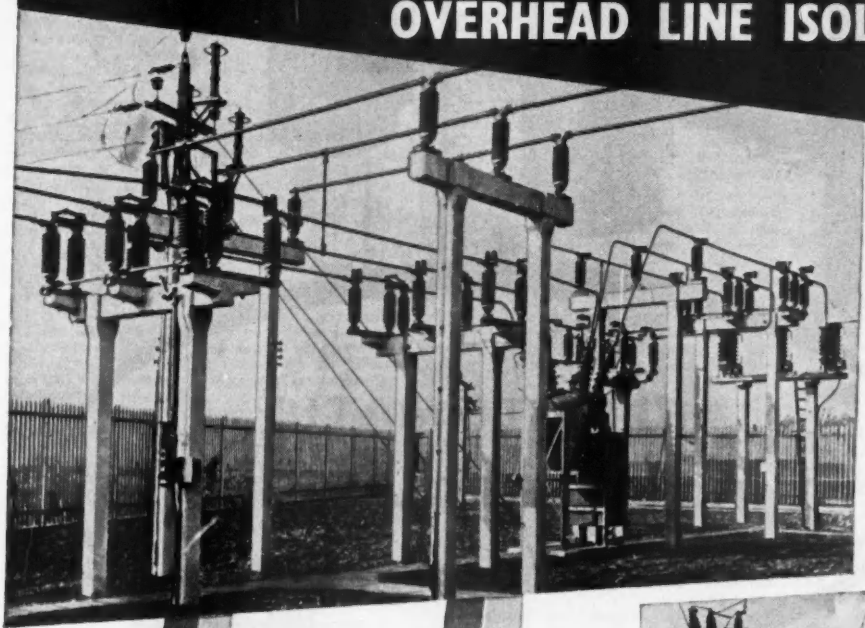
Radyne in design. 813,272. Class 7. Machines for welding, bronzing, brazing, etc. 813,273. Class 9. Laboratory furnaces, etc. 813,274. Class 11. All goods. Radio Heaters Ltd., 42 Bedford Ave, W.C.1.

Vernaid. 817,903. Class 7. Machinery and apparatus for the disposal of waste products, etc. Vernon and Co. Ltd., Penwortham Mills, Preston, Lancs.

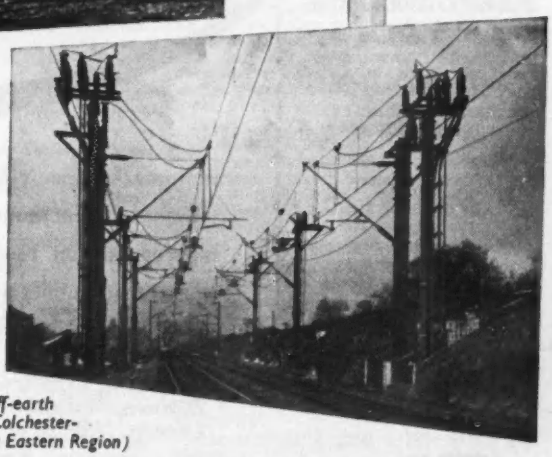
Vibromatic. 819,856. Class 8. Shavers, etc. Needle Industries Ltd., 106 Edmund St, Birmingham.



HACKBRIDGE AND HEWITTIC H.V. OUTDOOR OVERHEAD LINE ISOLATORS



Illustrated above: *Close up and general views of Hackbridge and Hewittic type RVB and RDB 33 kV isolators installed at Shepreth Substation, Eastern Electricity Board.*



Illustrated right: *Hackbridge and Hewittic 25 kV on-off-earth rotating type isolators installed on the Colchester-Clacton-Walton Lines (British Railways Eastern Region)*

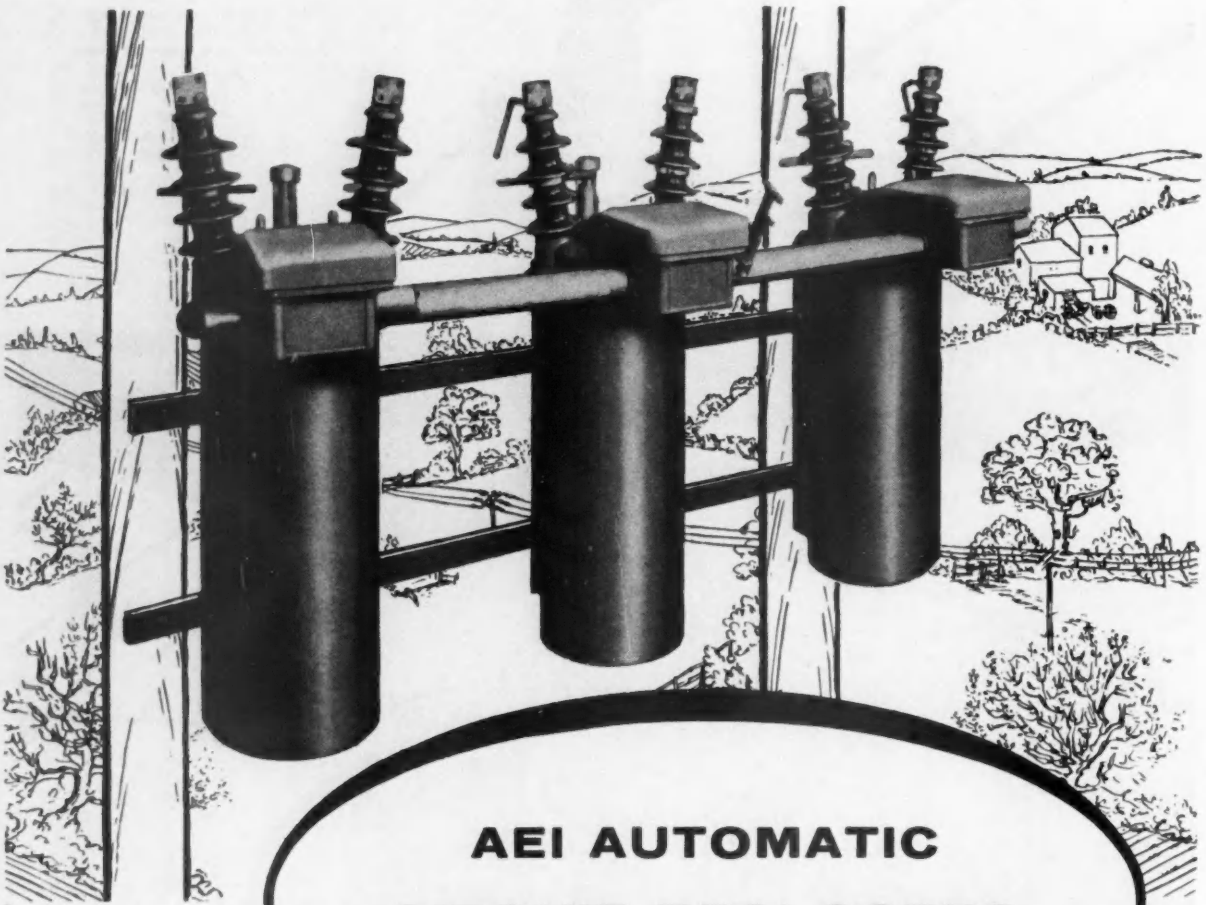
HACKBRIDGE AND HEWITTIC ELECTRIC COMPANY LTD

HERSHAM · WALTON-ON-THAMES · SURREY

Telephone: Walton-on-Thames 28833 (8 lines) ***Telegrams & Cables: "Electric, Walton-on-Thames"***

TRANSFORMERS • RECTIFIERS • LINE GEAR

. . . Keep supply lines clear



AEI AUTOMATIC CIRCUIT-RECLOSERS

PERFORMANCE DETAILS

SUPPLY: *Up to* 11-*kV*

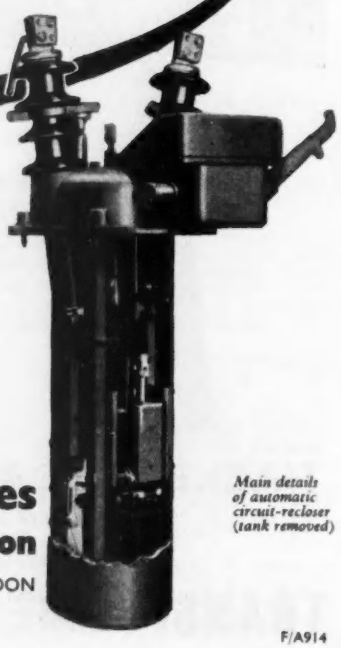
BREAKING CAPACITY: *Up to* 75 *MVA*

CURRENT RATING: 5 *to* 200 *amperes*

DUTY CYCLE: 2 *instantaneous* or 2 *time-delayed trips, and* 4 *instantaneous trips*

Automatic Circuit-Reclosers Type RB from AEI prevent transient faults from causing lengthy supply interruptions on rural lines. Experience has also proved that on lines protected by these reclosers, the number of persistent faults is considerably reduced.

*For further details, write to AEI Switchgear Division, Willesden Works, Neasden Lane, London, N.W.*10 *or to your local AEI office.*



Main details of automatic circuit-recloser (tank removed)

AEI **Associated Electrical Industries**

Switchgear Division

TRAFFORD PARK, MANCHESTER · HIGHER OPENSHAW, MANCHESTER · WILLESDEN, LONDON

F/A914

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

ELECTRICITY CORPORATION OF NIGERIA
132 kV Single Circuit Transmission Line—Kaduna/Zaria and Zaria/Kano

TENDERS are invited for the supply and erection of approximately 45 miles of single circuit 132 kV transmission line between Kaduna/Zaria and 85 miles of single circuit 132 kV transmission line between Zaria/Kano.

Tenderers must be prepared to submit offers on the assumption that contracts will be awarded separately or conjointly, but the purchaser reserves the right to place separate contracts for parts of the work.

The contract/s include for the manufacture, supply, testing, insurance, packing for export, shipment to a tropical climate, complete delivery to site, erection, testing, commissioning and maintenance for 12 calendar months of the whole of the contract works.

A short précis of the extent of the works for which complete and comprehensive offers are invited may be had on application to the Resident Engineer, The Electricity Corporation of Nigeria, Adelphi, John Adam St, London W.C.2, or the Secretary, Electricity Corporation of Nigeria, 13 Broad St, Private Mail Bag 2030, Lagos.

Tender documents which will be available from 10 July, 1961, may be obtained from the same addresses on receipt of payment by cheque for £12 in favour of the Electricity Corporation of Nigeria. This payment will not be refundable.

Completed tenders must be under sealed cover endorsed "Tender for Kaduna—Zaria—Kano 132 kV Transmission Line" and must be received at the office of the Resident Engineer, The Electricity Corporation of Nigeria, Adelphi, John Adam St, London W.C.2, by 12 noon on 27 Sept., 1961.

The Electricity Corporation do not bind themselves to accept the lowest or any tender nor will they be responsible for any costs incurred by tenderers in making their tender.

G. W. E. NICOL,
Secretary to the Corporation.
(B 381)

APPOINTMENTS VACANT

CAMBRIDGESHIRE EDUCATION COMMITTEE
Cambridgeshire College of Arts and Technology

(Principal: D. E. Mumford, M.A.)

ASSISTANT LECTURER GRADE B IN ELECTRICAL ENGINEERING

REQUIRED 1 Sept., or as soon as possible afterwards. Minimum qualifications an H.N.C. in Electrical Engineering with appropriate industral experience. Some teaching experience desirable.

Present salary scale £700 x £27 10s—£1,150, with additions for training, degree (£90) and good Honours degree (£75). Starting point on scale depends on previous experience and war service.

Further particulars and application forms, to be returned as soon as possible, from the Principal, Cambridgeshire College of Arts and Technology, Collier Rd, Cambridge.

G. D. EDWARDS,
Chief Education Officer.

Shire Hall,
Cambridge. (B 392)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

MELKSHAM District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class G, Grade 9 (£965/£1,090 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1374, not later than 24 July, 1961.

INSTALLATION ASSISTANT

Heston District of No. 1 (Southall) Sub-Area. Salary: N.J.B. Class H, Grade 11 (£940/£1,065 per annum, inclusive of London Allowance). N.J.B. Conditions of Service.

Applicants should have had experience in the preparation of specifications and estimates for all types of electrical installations. They should be competent to supervise electricians and organise the allocation of work.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill La, Southall, Middlesex, and returned to him quoting Z.1365, not later than 24 July, 1961.

ASSISTANT ENGINEER (PLANNING)

Melksham District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class G, Grade 10 (£890/£1,015 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1375, not later than 24 July, 1961.

The successful applicants for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme. (B 399)

MIDDLESEX COUNTY COUNCIL
Education Dept.

LABORATORY STEWARD

REQUIRED at Enfield Technical College, Queensway, Enfield, Middx., for Dept. of Electrical Engineering. Duties mainly in Electrical Machines Lab. and involving maintenance and minor repairs to machines and associated apparatus in addition to servicing lab. Should have adequate practical experience in electrical industry and O.N.C. or C. and G. Course "C" Cert. in Electrical Installation work advantage. Salary: Misc.V, £685/760 plus London Weighting up to £40. Prescribed conditions. Write full particulars to Principal, above address, by 26 July. (Quote G.802/ET.) (B 407)

YORKSHIRE ELECTRICITY BOARD
No. 5 (Wakefield) Sub-Area

DONCASTER DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

APPLICANTS should have had a sound training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Candidates must be prepared to reside in the district and undertake standby duty.

Salary: N.J.B. Class H, Grade 9 (Scale 8), £1,040/£1,165 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 28 July, 1961.

No. 6 (Hull) Sub-Area

FOURTH ASSISTANT ENGINEER
(METERS, TESTING AND PROTECTION)
TWO POSTS

Applicants should have had a good general and technical education with some experience in the electrical industry subsequent to technical training.

The duties will include commissioning, testing, maintenance and repair of metering and protection equipment, fault location and general electrical testing throughout the Sub-Area.

The work is varied and interesting and offers opportunities of gaining valuable experience.

Salary: N.J.B. Class L, Grade 13 (Scale 7), £965/£1,090 per annum.

GOOLE DISTRICT
DEMONSTRATOR

Candidates should have had Domestic Science Training, including Housecraft, and should preferably hold the E.A.W. Certificate or Diploma. They should be competent to lecture and advise consumers on the utilisation of domestic electrical appliances and be able to give demonstrations with a sales emphasis. The successful candidate will normally be located at Goole, but may be required to work throughout the Sub-Area if occasion demands.

Salary: Demonstrator N.J.C. Grade 1, £600/£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 28 July, 1961.

No. 7 (Grimsby) Sub-Area

GAINSBOROUGH DISTRICT
SECOND ASSISTANT DISTRICT ENGINEER

Applicants should have had a sound training and extensive experience in the design, construction, operation and maintenance of H.V. and L.V. underground and overhead distribution systems, substation plant and ancillary equipment in both urban and rural areas.

Salary: N.J.B. Class E, Grade 7 (Scale 7), £965/£1,090 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 28 July, 1961.

No. 4 (Leeds) Sub-Area

SENIOR ASSISTANT
(ESTATES AND WAYLEAVES)

The successful applicant will be required particularly to assist the Section Head in the more advanced work of acquisition of operational sites. Experience of site negotiations is essential. Experience of the management of non-operational property and of wayleave negotiations will be an advantage.

Salary: N.J.C.4, £890 x £30—£1,010 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, nr. Leeds, not later than 28 July, 1961. (B 394)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

VICTORIA UNIVERSITY OF WELLINGTON NEW ZEALAND

SENIOR LECTURER IN APPLIED ELECTRONICS

APPLICATIONS are invited for the above-mentioned appointment. The primary purpose of the appointment is to advance the practice of Applied Electronics generally and the appointee will be expected to do this by all appropriate means. He will be expected to initiate research or development work having a bearing on New Zealand industry, to seek a close acquaintance with industrial problems and opportunities in New Zealand, and to foster a knowledge of basic electronics within industry. An annual grant will be made by the University to assist this work.

The appointee will be attached to the Department of Physics and his teaching and other duties will be suitably restricted in scope so as not to interfere with the primary purpose of the appointment.

The salary will be £1,750 per annum rising to £2,000 per annum. The initial salary will be determined according to the qualifications and experience of the appointee.

Approved fares to Wellington will be allowed for the appointee, his wife and his dependent children. In addition, actual removal expenses will be allowed within specified limits.

Further particulars, and information as to the method of application, may be obtained from the Secretary, Association of Universities of the British Commonwealth, Marlborough Hse, Pall Mall, London S.W.1.

Applications close in New Zealand and London on 1 Sept., 1961. (B 374)

COUNTY OF LANARK

ASSISTANT ENGINEER (LIGHTING)

APPLICATIONS are invited for the post of Assistant Engineer (Lighting), on the salary scale £1,475/£1,605. Applicants should be Corporate Members of the Association of Public Lighting Engineers or the Institution of Electrical Engineers and should have extensive knowledge of the design, erection and maintenance of public lighting installations.

Superannuation scheme in operation and five-day week. Medical examination.

Applications stating age, qualifications and experience, with the names and addresses of three referees, to be lodged with County Clerk, P.O. Box No. 1, Glasgow, by 31 July, 1961. (B 380)

UNIVERSITY OF SYDNEY

LECTURESHIP/SENIOR LECTURESHIP IN ELECTRICAL ENGINEERING

APPLICATIONS are invited for the above-mentioned position. Candidates should be well qualified in Electrical Engineering or Physics and should have had general experience in electronics and have considerable detailed knowledge of solid state devices and circuits. It is anticipated the successful applicant will take part in the teaching of electronics and communication engineering, including fundamental aspects of solid state devices and circuits, and in research on solid state devices and their application in communication engineering systems.

The salary for a Senior Lecturer is within the range £A2,550 x £A95—£A3,000 per annum; for a Lecturer within the range £A1,730 x £A105—£A2,435 per annum. In each case cost of living adjustments will be allowed (at present £A42 p.a.). The salary is subject to deductions under the State Superannuation Act. The commencing salary will be fixed according to the qualifications and experience of the successful applicant.

Under the Staff Members' Housing Scheme, in cases approved by the University and its Bankers, married men may be assisted by loans to purchase a house.

Further particulars, and information as to the method of application may be obtained from the Secretary, Association of Universities of the British Commonwealth, Marlborough Hse, Pall Mall, London S.W.1.

Applications close in Australia and London on 15 Sept., 1961. (B 375)

CITY AND COUNTY OF BRISTOL

APPOINTMENT OF MECHANICAL/ELECTRICAL ENGINEERS GRADE APT. IV (£1,140/£1,310 p.a.)

APPLICATIONS invited from Mechanical/Electrical Engineers for posts in Main Drainage Section of City Engineer and Planning Officer's Department.

Duties will include basic design and preparation of specifications for the mechanical and electrical plant associated with large pumping stations, dual fuel generating equipment and sewage treatment works machinery, cable and lighting layouts. Later duties will include site supervision and plant operation and testing.

Candidates should have served an engineering apprenticeship or have evidence of suitable practical training with preferably some operational experience of high and medium voltage switchgear and control gear.

Minimum qualification will be Higher National Certificate in either Mechanical or Electrical Engineering and at least five years' experience in the appropriate profession.

Posts permanent, pensionable; medical examination and, except in case of an officer transferred from service of another Local Authority, probationary period of six months. Five-day week; staff restaurant facilities.

Housing needs of successful candidates and question of a contribution towards removal expenses will receive favourable consideration.

Applications should be arranged in the following order:

Age, nationality and whether married or single; education; training; professional qualifications; present position with salary and date of appointment; previous positions with salaries and dates of appointment; details of experience; any further remarks in support of application; notice required to terminate present appointment; whether related to a member or senior officer of the Council; names of two referees.

Canvassing disqualifies.

Applications to reach the City Engineer and Planning Officer, Cabot Hse, Deanery Rd, Bristol 1, by 31 July. (B 384)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

South Staffs. and North Worcs. Area

FIRST ASSISTANT DISTRICT ENGINEER STOURBRIDGE DISTRICT

Applicants should have had experience in all branches of District work, including the planning of H.V. and L.V. distribution systems, and the operation and maintenance of high and low voltage cables, switchgear and transformers. Technical qualifications desirable. Salary: £1,190/£1,325 per annum (N.J.B. Grade F.5).

Apply, by letter, within 14 days, stating age, qualifications, experience, present position and salary to Mr D. Holt, Acting Area Manager (Ref. EMI/SEC), Midlands Electricity Board, P.O. Box No. 9, Toll End Rd, Tipton.

Shropshire and Herefordshire Area

SECOND ASSISTANT DISTRICT ENGINEER SHREWSBURY DISTRICT

Duties include the planning, construction, operation and maintenance of H.V. and M.V. mains and substations within the District. Technical qualifications desirable. Salary: £1,040/£1,165 per annum (N.J.B. Grade F.7).

Apply, by letter, within 14 days, stating age, qualifications, experience, present position and salary to Mr W. Winwood, Area Manager, Midlands Electricity Board, Spring Gdns, Ditherington, Shrewsbury.

F. W. CATER,
Secretary.
(B 382)

THE NORTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER
DESIGN SECTION
SUB-AREA ENGINEER'S DEPARTMENT
MANCHESTER

APPLICANTS should be familiar with the problems involved in the design of large power networks as applied to city areas. The duties will mainly consist of the long-term planning and engineering development of major schemes involving 33 kV, 11 kV and 6·6 kV networks. Candidates should have received technical education up to at least H.N.C. level or its equivalent, and preferably have served a recognised engineering apprenticeship. Preference will be given to those candidates who are Chartered Electrical Engineers.

Salary Scale: £1,650/£1,830 p.a. Grade M.6. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 1 Sub-Area (Staff Vacancy), The North Western Electricity Board, Town Hall, Manchester 2, P.O. Box 493, and returned to him by 24 July, 1961. (B 369)

FEDERAL POWER BOARD

APPOINTMENT: SECTION ENGINEER

APPLICATIONS are invited for the appointment of Section Engineer at Sherwood.

Salary.

£2,025 x £75—£2,250 per annum. There is a pension scheme which the successful applicant will be required to join.

Housing.

A four-bedroom house with hard furniture will be provided at a low rental in the town of Que Que, where there is a full range of Federal Government schools. Transport between Que Que and Sherwood (distance about 17 miles) will be provided.

Qualifications.

Candidates must be Associate Members of the Institution of Electrical Engineers. A University degree in electrical engineering is desirable.

Experience.

Candidates should have had several years' experience in the maintenance and operation of a high voltage transmission or distribution system.

Duties.

The Section Engineer will be responsible for the maintenance and local operation of two large 330 kV substations and about 300 miles of transmission line, and the administration of two maintenance depots.

Applications.

Applications giving full details of education, training, experience, age and marital status should be posted so as to reach The Secretary, Federal Power Board, P.O. Box 630, Salisbury, Southern Rhodesia, not later than 4 Aug., 1961.

23 June, 1961.
4/110
JD/LC (B 368)

UGANDA GOVERNMENT

Public Works Department

INSPECTOR OF WORKS (ELECTRICAL)

REQUIRED. Appointment on contract for one tour of 21-36 months in first instance. Salary according to age and experience in scale (including Inducement Pay) rising to £1,671 a year. Gratuity 25% of total salary drawn. Outfit allowance £30 payable. Free passages. Liberal leave on full salary.

Candidates should be 29-40 years of age, and it is essential that they possess O.N.C. (Electrical) or equivalent qualification. They should also have served a full apprenticeship and had subsequent experience in maintenance of industrial electrical equipment and large installations. They must be fully conversant with U.K. Home Office Electricity Rules, Electricity Regulations under the Factories Act and those of the Electrical Commissioners.

Apply to CROWN AGENTS, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/50987/EE. (B 370)

THE NORTH EASTERN ELECTRICITY BOARD

APPOINTMENT OF ASSISTANT CHIEF ENGINEER
(DISTRIBUTION SYSTEM PLANNING)

APPLICATIONS are invited from suitably experienced Chartered Electrical Engineers for the above appointment at the Board's Headquarters, Carliol Hse, Newcastle upon Tyne. The vacancy arises because of the impending retirement, early next year, of Mr. G. S. Lisle, M.I.E.E.

This Assistant Chief Engineer is responsible directly to the Chief Engineer for the distribution system design policy and practice on all the Board's distribution systems and also at Head Office for the planning of major system reinforcements. The selection of plant and equipment and the detailed design of substations and mains are the responsibility of one of the other Assistant Chief Engineers.

The salary and conditions of service are in accordance with the National Joint Managerial and Higher Executive Grades Committee Agreement, Class B, Grade 8, salary £2,595/£2,815 per annum.

Applications should be marked "Confidential" and addressed to Assistant Secretary (Establishments), The North Eastern Electricity Board, Carliol Hse, Newcastle upon Tyne 1, to be received by 29 July, 1961. (B 390)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

STATION SHIFT CONTROL ENGINEER
WARWICK POWER STATION
Vacancy No. 159/61.

APPLICATIONS are invited for the position of Station Shift Control Engineer at Warwick Power Station, Emscote Rd, Warwick.

Candidates should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class E, Grade 10 (£765/£870 per annum) of the National Joint Board Agreement, plus £90 per annum allowance for shift duties.

Closing date for receipt of applications: 28 July, 1961.

ASSISTANT INSTRUMENT ENGINEER
SPONDON POWER STATION
Vacancy No. 164/61.

Applications are invited for the position of Assistant Instrument Engineer at Spondon Power Station, Thulston Rd, Borrowash, nr. Derby.

Applicants should possess a sound technical training and have practical experience of moden power station instrumentation and automatic control. Experience of electronic equipment will be a distinct advantage.

The salary will be in accordance with Class J, Grade 9 (£1,115/£1,245 per annum) of the N.J.B. Agreement.

Closing date for receipt of applications: 28 July, 1961.

GENERAL ASSISTANT ENGINEER
(ELECTRICAL MAINTENANCE)
DRAKELOW "A" AND "B" POWER STATIONS
Vacancy No. 165/61.

Applications are invited for the position of General Assistant Engineer (Electrical Maintenance) at Drakelow "A" and "B" Power Stations, nr. Burton-on-Trent.

Preference will be given to candidates who hold the Higher National Certificate or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class M, Grade 16 (£825/£940 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 28 July, 1961.

GENERAL ASSISTANT ENGINEER
(EFFICIENCY AND PLANNING)
DRAKELOW "A" AND "B" POWER STATIONS
Vacancy No. 166/61.

Applications are invited for the position of General Assistant Engineer (Efficiency

continued in next column

continued from previous column

and Planning) at Drakelow "A" and "B" Power Stations, nr. Burton-on-Trent.

Preference will be given to candidates who hold the Higher National Certificate or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class M, Grade 16 (£825/£940 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 28 July, 1961.

These appointments are pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned and returned to him by the specified date.

O. S. WOODS,
Assistant Regional Director.
(B 396)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT MAINTENANCE ENGINEER
(MECHANICAL)

REQUIRED at Walsall Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade J.7, £1,275/£1,410 per annum.

A sound technical training and practical experience in modern power station mechanical maintenance is required and the possession of appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 182/61 MD on form AE6, available from the Station Superintendent, Walsall Power Station, Reedswood La, Birchills, Walsall, Staffs, by 24 July, 1961. (B 397)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. Schedule A appointments in the South Wales Division:

MAINTENANCE ENGINEER (ELECTRICAL)
USKMOUTH "B" POWER STATION
WEST NASH, NEAR NEWPORT, MON.
Vacancy No. 225/ET/61.

Salary: Class K, Grade 5, Scale 14, £1,535/£1,720 per annum.

Applicants should have had experience of power station maintenance and should preferably be Corporate Members of the Institution of Electrical Enginers.

STATION SHIFT CONTROL ENGINEER
UPPER BOAT POWER STATION
NEAR PONTYPRIDD, GLAM.
Vacancy No. 226/ET/61.

Salary: Class H, Grade 10, Scale 7, £965/£1,090 per annum, plus 10% shift allowance.

Applicants should possess H.N.C. or equivalent qualifications and have had operating experience in a modern power station.

ASSISTANT ENGINEER (HANDLING)
ABERTHAW POWER STATION
THE LEYS, NEAR BARRY, GLAM.
Vacancy No. 227/ET/61

Salary: Class L, Grade 12, Scale 8, £1,040/£1,165 per annum.

The successful applicant will be responsible for the operation of the coal, ash and dust handling plant of a 600 MW power station.

Applicants should have a sound mechanical background and considerable experience in a supervisory capacity.

Possession of technical qualifications would be an advantage.

Special application forms, obtainable from Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 29 July, 1961. (B 391)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable position as a

THIRD ASSISTANT ENGINEER

in the Planning and Economics Section of the Chief Commercial Officer's Department at Board Head Office.

Applicants should have had experience in the generation and/or distribution side of an electricity supply undertaking and should have had a sound general education and technical training to not less than Higher National Certificate standard.

Salary: N.J.B., Class BX, Grade 8, £1,145/£1,410 per annum.

Applications, on the standard form, quoting reference number C.10/61, should be submitted to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 28 July, 1961. (B 383)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

REGIONAL ELECTRICAL DEPARTMENT

APPLICATIONS are invited from suitably qualified engineers for the following positions in the System Planning and Development Section of the Regional Technical Branch at Leeds.

SECOND ASSISTANT ENGINEER (ONE)
(CALCULATIONS)

The person appointed will be responsible for the calculations required for the design and operation of the power system in the Region, comprising generating and transmission plant now operating at voltages up to 275 kV and supplying static, rotational and fluctuating loads.

In the light of the studies carried out the successful candidate will be expected to plan suitable modifications and extensions to the system. He will be in charge of a small group of engineers and responsible for the efficient use and development of one a.c. and three d.c. calculators.

Salary: N.J.B. Class BX, Grade 4 (£1,510/£1,830 per annum).

FOURTH ASSISTANT ENGINEERS (THREE)

To assist with system studies employing a.c. and d.c. calculators, and with planning extensions to the transmission system.

Salary: N.J.B., Class BX, Grade 9, 10 or 11 (£900/£1,325 per annum), according to qualifications and experience.

Applications should be made on Form AE6 obtainable from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 2 Aug., 1961. (B 401)

CITY OF CARDIFF EDUCATION COMMITTEE

Llandaff Technical College

(Principal: J. Cotterell, M.I.E.E., A.I.MECH.E., A.M.I.PROD.E.)

DEPARTMENT OF ELECTRICAL ENGINEERING

APPLICATIONS are invited for two posts, Grade A and Grade B, in the Electrical Engineering Department, to commence on 1 Sept., 1961, or as soon as possible thereafter.

The successful applicants will be required mainly to teach students in the City and Guilds Courses: Electrical Technicians, Electrical Fitters and Electrical Installation Work, for which there are Block Release, Part-time Day and Evening Classes.

Applicants should have suitable academic qualifications and experience in Electrical Installation of Electrical Fitting or Electronic Servicing. Experience in an Electrical Drawing Office would be an added advantage.

Salary Grade A or B according to qualifications and experience.

Further particulars and application forms can be obtained from the undersigned, and should be returned to the Principal within 14 days of the appearance of this advertisement.

R. E. PRESSWOOD,
Director of Education.
(B 393)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER
TWICKENHAM AND RICHMOND DISTRICT

SALARY: £1,115/£1,245 per annum, plus London allowance under N.J.B. Class G, Grade 7. Superannuable. Preference given to applicants with technical qualifications up to H.N.C. standard and with practical experience of the planning, construction, operation and maintenance of MV and 11 kV underground systems. Consideration will be given to a private car allowance and assistance in house purchasing in appropriate circumstances. The successful applicant will be required to undertake standby duties.

Applications, quoting ET, on forms from District Manager, Seeboard, 42 York St, Twickenham, Middlesex, by 26 July, 1961.

ASSISTANT DISTRICT ENGINEER
GUILDFORD DISTRICT

Salary: £1,040/£1,165 under N.J.B. Class F, Grade 7. Superannuable. Preference given to applicants with technical qualifications up to H.N.C. standard and with practical experience of the planning, construction, operation and maintenance of MV and 11 kV underground and overhead systems. Consideration will be given to a private car allowance and assistance in house purchasing in appropriate circumstances. The successful applicant will be required to undertake standby duties.

Applications, quoting ET, on forms from District Manager, Seeboard, Woodbridge Rd, Guildford, Surrey, by 26 July, 1961.

FITTER (ELECTRICAL)
BRIGHTON AND HOVE DISTRICT

Wages: 5s 6½d per hour for a 42-hour, five-day week under N.J.I.C. Agreement. Candidates should have served a recognised Craft Apprenticeship and have had experience in the erection and maintenance of High Voltage and Medium Voltage switchgear, transformers and associated control equipment. Contributory Pension Scheme optional.

Applications, quoting ET and naming two referees, to District Manager, Seeboard, Electric Hse, Castle Square, Brighton, by 24 July, 1961.

GEORGE WRAY,
Secretary.
(B 395)

ADMINISTRATIVE COUNTY OF LEICESTER

ASSISTANT ELECTRICAL ENGINEER
£960/£1,310

CANDIDATES must be Associate Members of the Institution of Electrical Engineers or be in possession of the Higher National Certificate and be experienced in the design of electrical installations for all types of buildings. Removal expenses and lodging allowance may be paid to a married man. Apply on form available from the County Architect, 123 London Rd, Leicester. (B 10)

CONSULTING ENGINEERS

require an

ELECTRICAL ENGINEER

between the ages of 25 and 30 who is a Graduate of the Institution of Electrical Engineers, for preparing specifications and contracts for inspection of electrical and mechanical equipment for water supply schemes at Works. The vacancy provides a good opportunity for an electrical engineer to obtain mechanical engineering experience.

Salary according to experience and ability. Five-day week, luncheon vouchers and pension scheme. Write, giving full details to Binnie, Deacon and Gourley, Artillery Hse, Artillery Row, London S.W.1. (B 411)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

GENERAL ASSISTANT ENGINEERS
(DRAWING OFFICE) (CIVIL)

APPLICATIONS are invited for appointments as General Assistant Engineers (Drawing Office) (Civil), in the Midlands Project Group's Drawing Office, at Bournville, Birmingham.

Candidates should possess a sound practical and technical training and be working towards a suitable professional qualification. The salary will be within either Grade 12, Scale 8, £920/£1,165; Grade 13, Scale 7, £840/£1,090; or Grade 15, Scale 5, £690/£940 per annum, in accordance with the National Joint Board Agreement.

Applications should be made on standard form AE6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham 30, and should be returned to him not later than 31 July, 1960.

Envelopes should be endorsed "C.E.G.B. Staff Confidential, No. MPG.48/61." (B 389)

RHODESIA AND NYASALAND

Federal Power Board

OPERATIONS DEPARTMENT VACANCY
CONTROL CENTRE ENGINEER

APPLICATIONS are invited for the above appointment at the Board's System Control Centre situated at Sherwood about 17 miles north of Que Que, Southern Rhodesia. The interconnected system to be controlled consists of 900 miles of 330 kV transmission connecting certain existing thermal stations with the Kariba Hydro-Electric Station. Total interconnected generating capacity is over 1,000 MW.

Applicants should have had experience in the operation of an interconnected high voltage system and preferably experience in Power Station operation. Qualifications leading to Associate Membership of the Institution of Electrical Engineers are desirable. The successful candidate will be responsible for the operation of the Board's interconnected system, including switching, load dispatching and associated duties. The salary for this appointment will be within the range £1,800 x £75—£2,025 per annum, plus 10% shift allowance depending on qualifications and experience.

The successful candidate will be required to contribute to the Board's Pension Fund and to join the medical aid fund, and he will be provided with a three-bedroomed house and hard furniture at a low rental at Que Que where there is a full range of Government Schools. Transport between Que Que and Sherwood is provided by the Board.

The reasonable travelling and removal expenses of the successful candidate and his family to Que Que will be paid by the Board.

Applications giving name, age, marital status and full details of education, training, experience and qualifications should be posted to reach the Secretary, Federal Power Board, P.O. Box 630, Salisbury, Southern Rhodesia, not later than 29 July, 1961.

Full details of current cost-of-living, local taxation and climatic conditions are available from the Office of the High Commissioner of Rhodesia and Nyasaland, Rhodesia Hse, 429 Strand, London. (B 328)

ELECTRICAL SALES ENGINEER

with some experience either electrical or mechanical, and knowledge of refrigeration, required by commercial firm in Georgetown, British Guiana. Attractive salary, overseas leave with return travelling expenses paid.

Write Box G.125, c/o Streets, 110 Old Broad St, E.C.2. (B 409)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

GENERATION ENGINEER

APPLICATIONS are invited for the post of Generation Engineer, Conon Valley and Affric Generation Group. The duties will include the operation and maintenance of the Hydro-Electric Stations at present within the Group together with 132 kV switching and transforming stations.

Applicants for the post should have sound technical qualifications and have had experience in the operation and maintenance of generating plant, auxiliary plant and switchgear. Salary commencing at a point within the range £1,965/£2,170 (N.J.M. 5B) depending on experience and qualifications. Superannuation Scheme.

Application forms, obtainable from The Secretary, 16 Rothesay Terr, Edinburgh 3, should be returned by 29 July, 1961

(B 386)

BOROUGH OF CREWE

Borough Engineer's Department

APPOINTMENT OF ELECTRICAL AND STREET LIGHTING SUPERINTENDENT

APPLICATIONS are invited from suitably qualified persons for the position of Electrical and Street Lighting Superintendent. Salary: Grade III, £960/£1,140 per annum.

The person appointed will be required to take full control of the Electrical and Street Lighting section of the Department, and be responsible for the preparation of electrical designs, specifications, estimates, etc., and the supervision of works carried out by Direct Labour or Contract.

Applications on forms to be obtained from the Borough Engineer, Municipal Buildings, Crewe, returnable not later than Thursday, 3 August, 1961.

A. BROOK,
Town Clerk.
(B 410)

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEER

APPLICATIONS are invited for the above position in the Board's Regency District at 38 Aybrook St, London W.1.

Applicants should have had a sound technical education to the standard of the Higher National Certificate, and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class J ,Grade 9, £1,165 per annum rising to £1,295 per annum, inclusive of London Allowance.

Applications stating age, qualifications and experience should be sent direct to the Manager at above address, within seven days of the publication date of this notice. Please quote ref.: PER/V/3328/T. (B 400)

SENIOR CONTRACTS ESTIMATOR

Capable of handling large commercial and industrial installation projects, required by progressive and expanding company. This is an executive appointment with salary scale £1,000/£1,250, superannuation and other benefits. A company car will be provided. Apply giving full details to:

Jardine and Smith
(Electrical Engineers) Ltd.,
47 Chatham St,
Bulwell, Nottingham.
(B 404)

AN ASSISTANT ENGINEER

is required by a large public company in

HONG KONG

He should preferably be under 35. Applicant must hold a Corporate or Graduate Membership of the Institution of Electrical Engineers, or equivalent qualifications, and must have theoretical training and practical experience in the installation and maintenance of high and low voltage underground and overhead mains, static substation plant and distribution equipment.

Salary will be approximately £2,500 per annum, payable in Hong Kong dollars. Rates of income tax in the Colony are low. First-class unfurnished quarters are provided and also free passages to and from Hong Kong, together with generous home leave on full pay.

The Company also has a Provident Fund and Retirement Scheme. Applicants should write in the first instance to Box No. 8365, Electrical Times, enclosing a recent photograph and giving fullest details of education, qualifications, experience, present position, age, marital status and the date available for leaving the U.K. Arrangements will then be made for suitable applicants to be interviewed in the U.K.

(B 405)

A leading Midlands manufacturer of electric wiring accessories seeks a SENIOR DESIGNER having specialised experience in this field, for which an appropriate salary will be paid. Position offers adequate scope for initiative and originality under congenial working conditions with all usual benefits. Holiday arrangements will be honoured.
Replies which will be treated with absolute confidence should be addressed to:

The Technical Director,
J. A. Crabtree and Co. Ltd.,
Lincoln Works, Walsall.

(B 403)

plastics **LACRINOID** plastics

invite applications for the following appointment:

FOREMAN ELECTRICIAN

This vacancy is for an energetic Foreman to take charge of the Electrical Maintenance section. He should have experience in repairs and maintenance of machines and general factory installation. Knowledge of the electronic control of instruments on production machines would be an advantage. This is a five-day week, salaried, staff position which carries a pension.
Please write in confidence to the Personnel Manager, Lacrinoid Products Ltd., Stafford Avenue, Gidea Park, Essex, or 'phone Hornchurch 52525. (B 376)

CONSULTING ENGINEERS

require for their London office

ENGINEER

with experience in the practical aspects of hydro-electric plant, particularly with knowledge of the design and specification of water wheels.

Applicant should have good educational background and preferably be a corporate member of one of the senior Institutions.

The appointment would be on the staff with salary according to qualifications.

Bonus and Pension Schemes.

Applications giving full details of age, qualifications and experience within 14 days to Preece, Cardew and Rider, 8, 10 and 12 Queen Anne's Gate, London S.W.1.

(B 377)

J. & P.

TRAINEE SALES ENGINEER

required in Sheffield

Johnson and Phillips Ltd. have a vacancy in their Sheffield Branch for a Trainee Sales Engineer and invite applications from ambitious young men with H.N.C. in electrical engineering. The successful applicant will in due course handle the selling of Capacitors, Switchgear, and Transformers.

J. and P. are one of the leading companies in the industry with factories and selling organisations in this country and throughout the Commonwealth.

Applications giving details of training, etc., should be addressed to the Employment Manager, Johnson and Phillips Ltd., Charlton, London S.E.7. (B 412)

GEORGE E. TAYLOR (LONDON) LTD.

Member of Turriff Group

MECHANICAL AND ELECTRICAL ESTIMATING ENGINEERS

required for expanding programme. Operating from headquarters at Brentford. Excellent opportunity for experience and advancement.

Attractive salary, bonus and pension scheme. Restaurant on premises, five-day week.

Write or call.

Group Personnel Manager,
TURRIFF GROUP
Turriff Building, Gt. West Road, Brentford, Middlesex

(B 378)

ALLEN WEST

ALLEN WEST & CO. LTD., BRIGHTON

Applications are invited for a vacancy in the Head Office Sales Department for a

CONTRACTS ENGINEER

for interesting and progressive work in the Contracts Section.

Candidates should be aged between 28 and 40 years, have received a good general education, be qualified to at least Ordinary National Certificate standard, and have had previous experience of motor control gear and switchgear.

Preference will be given to those having a sound experience with marine control gear.

Ability to deal with technical sales correspondence is essential, and also a pleasing personality, as the work involves direct contact with customers.

Applications in writing, giving full details of age, education, qualifications and experience, should be addressed to:

The Personnel Manager,
ALLEN WEST & CO. LTD.
BRIGHTON, 7

marking envelope CE/ET.

(B 387)

FOR SECURITY AND PROGRESS

THE CENTRAL ELECTRICITY GENERATING BOARD

wish to recruit

ASSISTANT DEVELOPMENT and PLANNING ENGINEER

at

CLARENCE DOCK POWER STATION
Waterloo Road, Liverpool 3.

Salary within range £1,350/£1,500 p.a. Superannuable.

The work involves investigation, appraisal and development of schemes to improve station costs, efficiency and availability.

Applications in writing to Personnel Officer, Central Electricity Generating Board, 825 Wilmslow Rd, Manchester 20, by 19 July, 1961. Please quote Vacancy No. E.180/305/E. (B 388)

CENTRAL ELECTRICITY GENERATING BOARD
West Midlands Division
ASSISTANT ENGINEER (RELIEF)

REQUIRED at Wolverhampton Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade E.12, £670/£750 per annum.

The engineer will be expected to carry out shift relief duties and when not so employed will be available to undertake duties in the maintenance and operation departments. Shift allowance as laid down in the N.J.B. Agreement will be paid when shift duties are worked.

Applicants should have received a sound technical training and appropriate qualifications will be an advantage.

Apply, quoting Vacancy No. 183/61 MD on form AE6, available from the Station Superintendent, Wolverhampton Power Station, Commercial Rd, Wolverhampton, to whom they should be returned when completed not later than 24 July, 1961. (B 398)

NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD
MAIN GRADE ENGINEER (ELECTRICAL)

REQUIRED. Applicants should be A.M.I.E.E., but graduate members will be accepted provided they have passed the Institution Examination of the Institution of Electrical Engineers.

Salary will be within the range of £950/£1,650. It is possible for Corporate members to enter at a salary point up to a maximum of £1,350, and graduate members at a point up to a maximum of £1,255, in respect of years of relevant experience since completing the appropriate examination.

Apply, stating age, qualifications (with dates) and experience, with names of two referees, to the Secretary, North West Metropolitan Regional Hospital Board, 40 Eastbourne Terr, W.2, quoting reference No. 948, by 24 July, 1961. (B 373)

ASSISTANT ELECTRICAL ENGINEERS with at least H.N.C. and two to three years' experience of E.H.V. transmission work required by Consulting Engineers in their Contracts and Design Department, Weybridge. Applications stating age, qualifications, experience and salary required to Kennedy and Donkin, 12 Caxton St, London S.W.1, quoting ref.: RWMc. (B 277)

ARMATURE WINDER required with experience of machines up to 100 h.p. Ideal opportunity for young skilled man to establish a permanent position and gain further experience. Apply in writing, giving age, experience, and present wages to Works Employment Officer, Fuller Electric Ltd., Fulbourne Rd, Walthamstow, E.17. (B 251)

CONSULTING Engineers in Westminster have vacancy for a qualified ELECTRICAL ENGINEER preferably experienced in lighting and power installation work, distribution, etc. Applicants are invited to send details of their age, qualifications and experience, etc., to Messrs Mackness and Shipley, Parliament Mansions, Abbey Orchard St, London S.W.1, quoting reference P.1210. (B 367)

ELECTRICAL ENGINEER SURVEYOR required by an Insurance Company for appointment as Inspecting Engineer—Southampton area. (Qualifications: Winding shop experience and technical education to H.N.C. standard.) Salary: £825/£1,225 per annum (progressive). Pension scheme. Car supplied. Apply: Chief Engineer, Cornhill Insurance Co. Ltd., P.O. Box 10, 57 Ladymead, Guildford, Surrey. (B 402)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House Sardinia Street, London, W.C.2

ELECTRICAL ENGINEERING ASSISTANTS required with experience in any of the following:

(1) Planning of electrical installations and preparation of specifications for new schools and other large buildings.

(2) Preparation of schemes of repair and improvement of electrical installations in all classes of buildings.

(3) Preparation of schemes and specifications for all types of electric lifts.

(4) The operation of maintenance contracts and arranging for servicing works on electric lifts.

Applicants should be Corporate Members of Institution of Electrical Engineers or hold some recognised technical qualification, e.g. National Certificate or Diploma of A.S.E.E. Up to £1,500 according to qualifications, age and experience. Pension scheme. Staff restaurant. Forms from Chief Engineer, (GS/T/1893/7), L.C.C., County Hall, S.E.1. (B 372)

JUNIOR DRAUGHTSMEN for Outdoor Contracts Department. Minimum requirement O.N.C. Young men whose interest lies in the field of supply and installation of electrical gear, underground cables, and overhead lines. Applications stating age and experience to Employment Manager, Johnson and Phillips Ltd., Victoria Way, Charlton, S.E.7. (B 363)

OVERHEAD TRANSMISSION LINE ENGINEERS. Large contracting organisation has vacancies in Scotland for Site Agents, Sub Agents and Engineers of proved ability with experience of steel tower overhead line construction. Age and full details of experience,, which will be treated in confidence, to Box No. 529, Keith and Co., 137 Princes St, Edinburgh. (B 303)

PART-TIME ELECTRICAL STORES CLERK or STOREKEEPER with very wide knowledge of components for evening or week-end work on collating, indexing and filing project. Write Box No. 8363, Electrical Times. (B 379)

SANGAMO WESTON LTD. require a REPRESENTATIVE for London and South Eastern area. Aged 25-35 years. Electrical background. Salary according to experience. Applications should be made to the Personnel Manager, Sangamo Weston Ltd., Cambridge Rd, Enfield, Middx. (B 408)

WORKS MANAGER for Plastic Cable Works. Important Company. Must be fully experienced practical man. Please state salary required to Box No. 8353, Electrical Times. (B 350)

YOUNG MAN, aged about 25, of good education, with sound electrical training, required as TECHNICAL REPRESENTATIVE for the sale of resistance alloys in the Midlands and South. Excellent prospects for the right man. Apply by letter to General Sales Director, Hall and Pickles Ltd., Port St, Manchester 1. (B 385)

APPOINTMENTS WANTED

CHARTERED ELECTRICAL ENGINEER, wide experience planning H.T. and L.T., Factory Installations, Lighting Schemes, etc., desirous of full or part-time occupation. Travelling enjoyed.—Box 8359, Electrical Times. (B 360)

CONTINENTAL Market. Chartered Electrical Engineer offers services. Experience all types equipment.—Box 8361, Electrical Times. (B 361)

GRADUATE ELECTRICAL ENGINEER, with considerable industrial experience, wishes executive position in light electrical or electro-mechanical manufacturing concern of repute. Financial interest required.—Box No. 8367, Electrical Times. (B 406)

WANTED

1 Metropolitan Vickers 220 V d.c. shunt wound Motor, 2½ b.h.p., 2,000 r.p.m., 9·9 A, rating Class 2. Drip Proof.—H. G. Millett and Co. Ltd., 62 Holdenhurst Rd, Bournemouth. (B 371)

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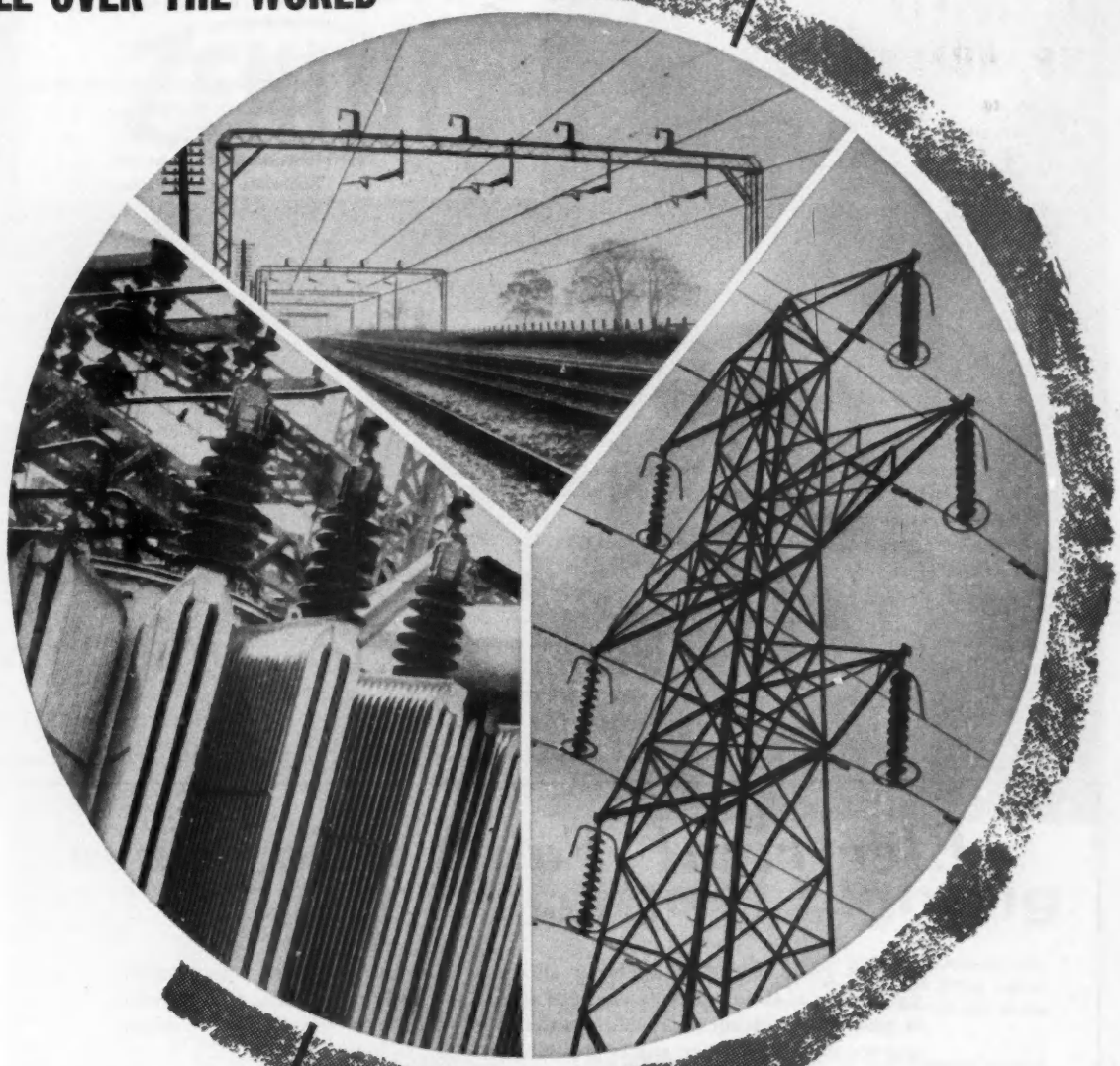

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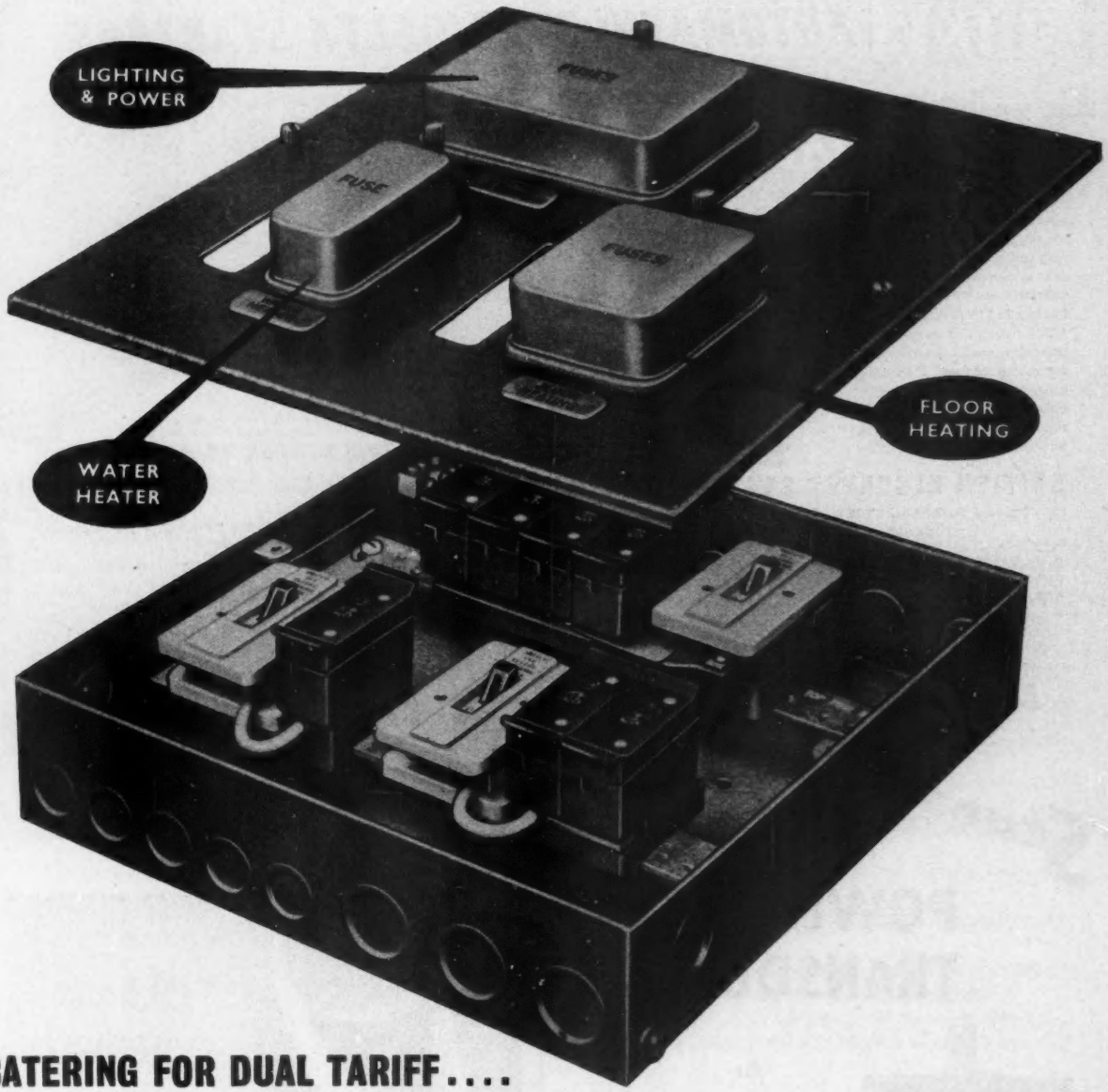

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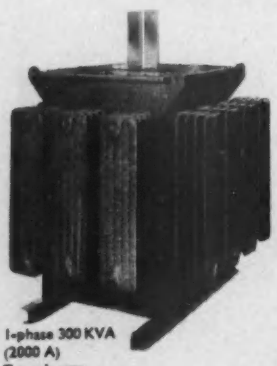

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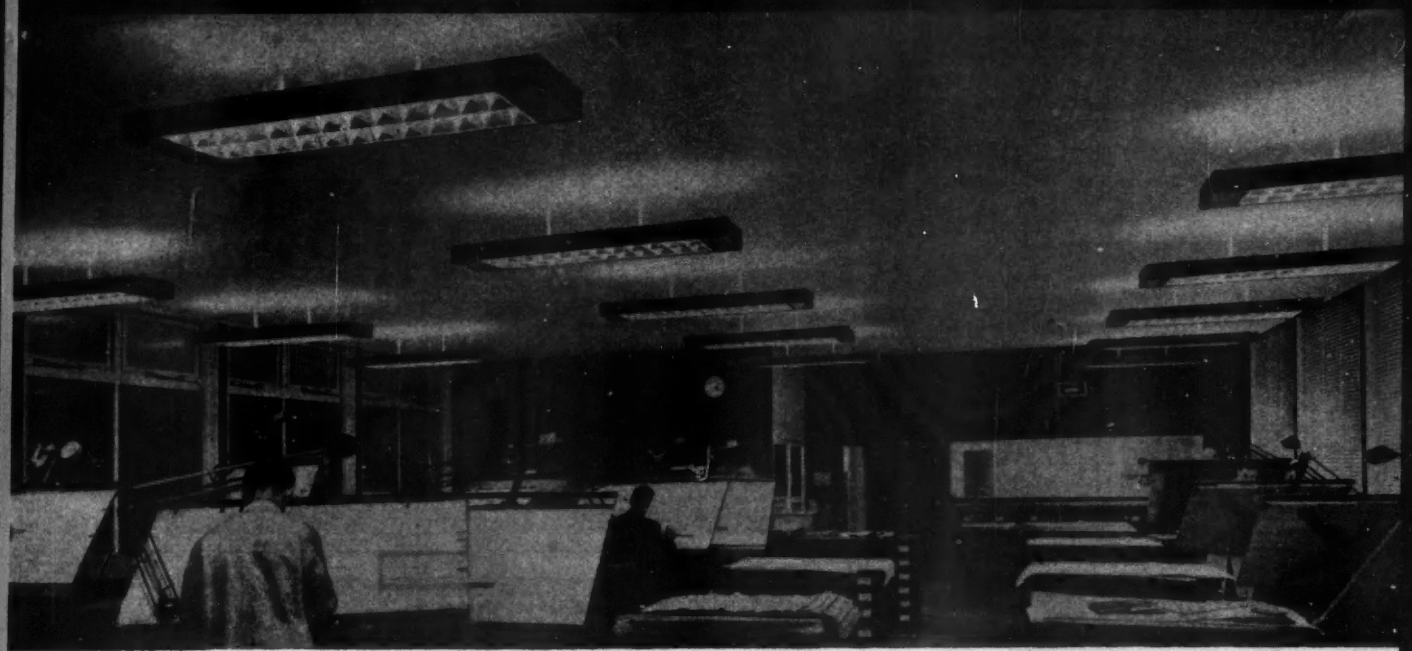

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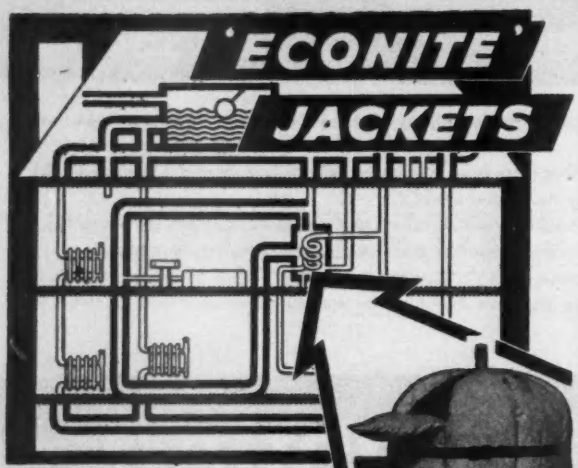

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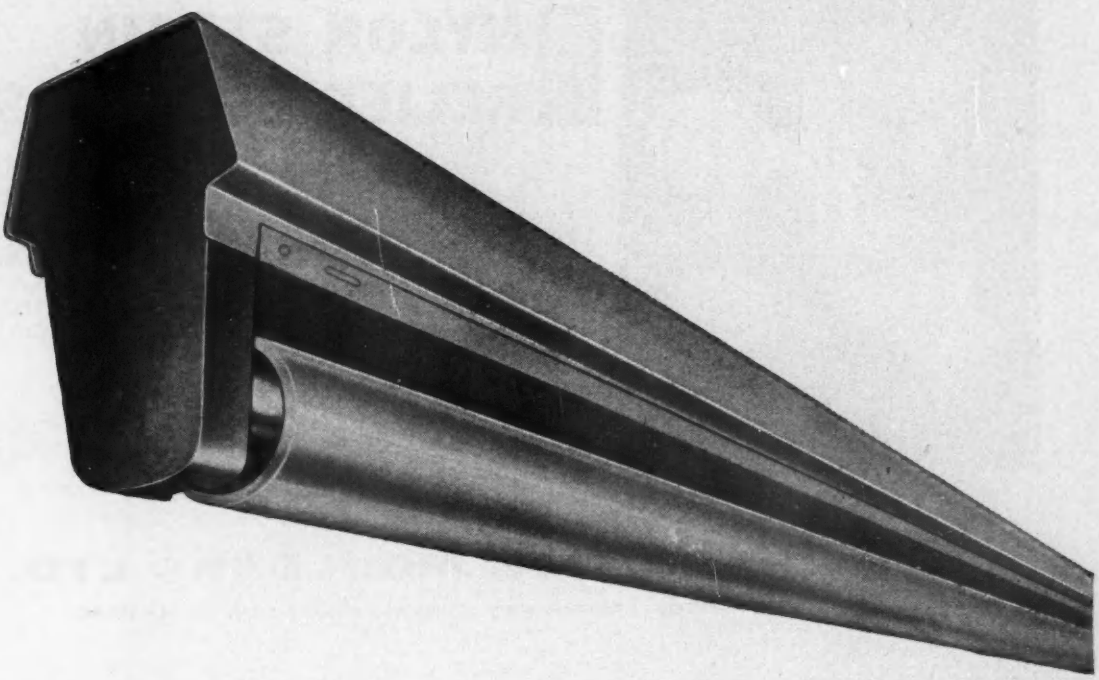

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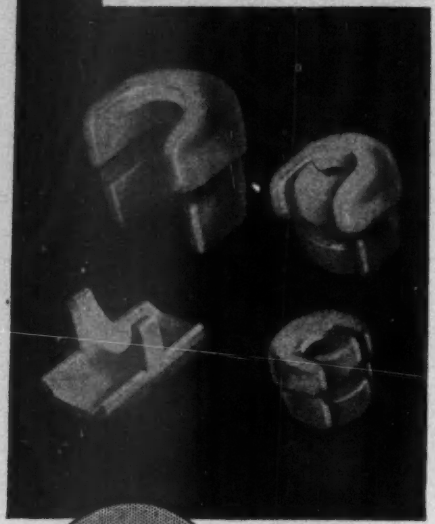

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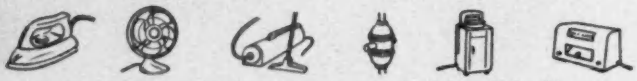

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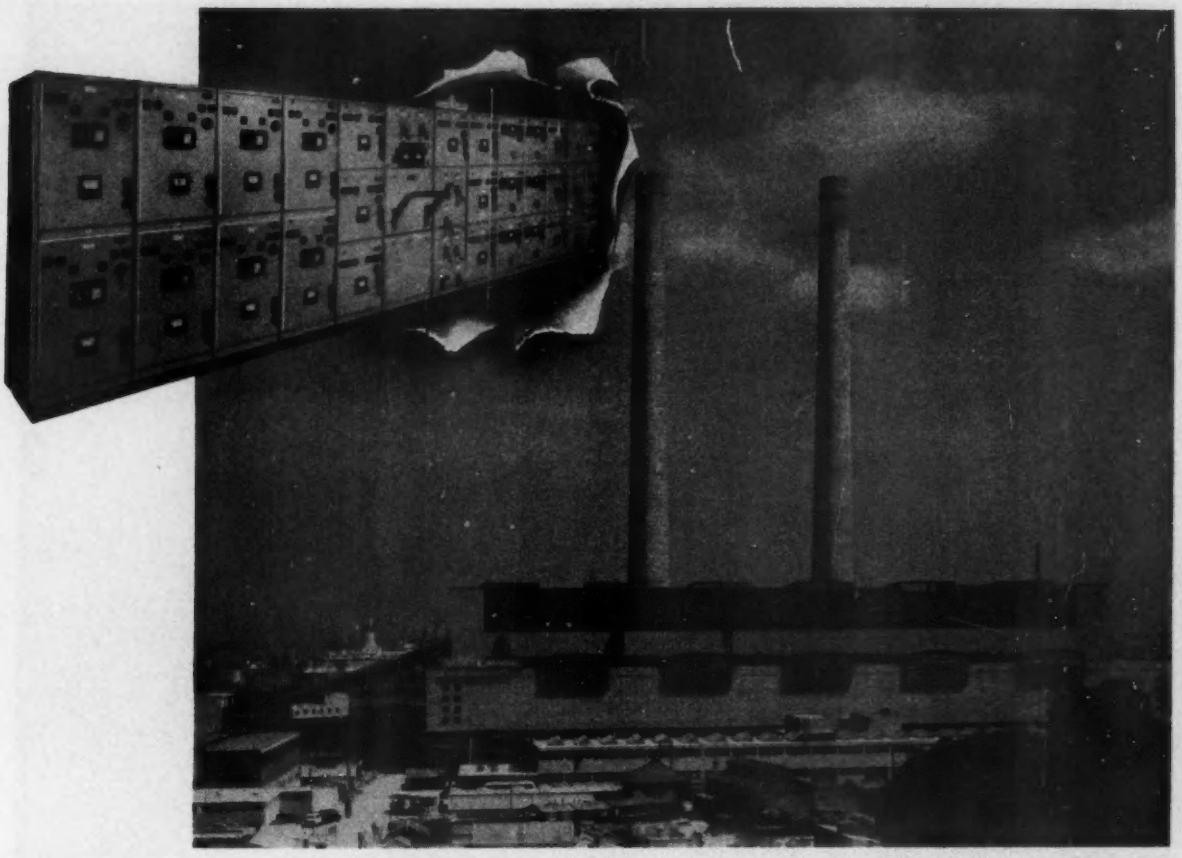

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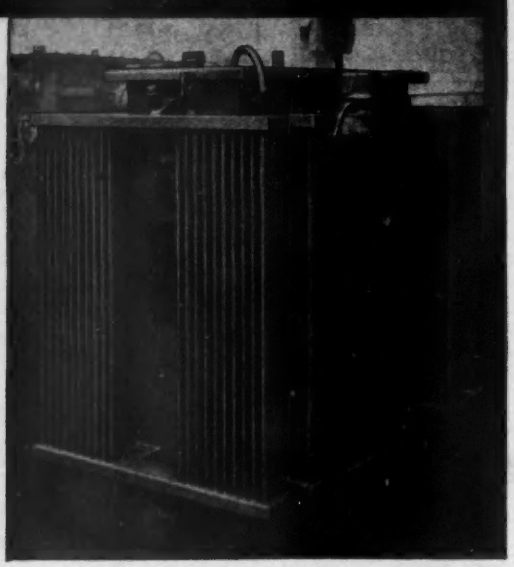

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